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MARINE MAMMAL PROTECTION ACT

Report of Secretary of Commerce

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This Part III was numbered incorrectly as originally published. This reprint contains the full text with the correct page numbers.

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

MARINE MAMMAL PROTECTION ACT

Report of the Secretary of Commerce

Section 103(f) of the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361, 86 Stat. 1027 (1972)) states that "Within six months after the effective date of this Act (December 21, 1972) and every twelve months thereafter, the Secretary shall report to the public through publication in the FEDERAL REGISTER and to the Congress on the current status of all marine mammal species and population stocks subject to the provisions of this Act. His report shall describe those actions taken and those measures believed necessary, including where appropriate, the issuance of permits pursuant to this title to assure the well-being of such marine mammals."

Section 3(12)(A) of the Act limits the responsibility of the Department of Commerce to those mammals which are members of the order Cetacea (whales and porpoises) and members, other than walruses, of the order Pinnipedia (seals and sea lions). Accordingly, there is published herewith the report of the Secretary of Commerce for the period June 22, 1973, to April 30, 1974, on the administration of the Act with regard to those mammals.

Issued at Washington, D.C., and dated June 18, 1974.

FREDERICK B. DENT,
Secretary of Commerce.

ADMINISTRATION OF THE MARINE MAMMAL PROTECTION ACT OF 1972, JUNE 1974

REPORT OF THE SECRETARY OF COMMERCE

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Prepared by The National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Washington, D.C. 20235, June, 1974.

ADMINISTRATION OF THE MARINE MAMMAL PROTECTION ACT OF 1972; JUNE 22, 1973, TO APRIL 30, 1974

Introduction—*Authority for the report and administration of the Act.* This report is made pursuant to requirements of section 103 (f) of the Marine Mammal Protection Act of 1972 (86 Stat. 1027; hereinafter, the "Act"). It covers the period from June 22, 1973, through April 30, 1974, and is prepared in three parts: The first deals with actions taken to assure the well-being of marine mammals; the second defines the current status of the stocks of marine mammals for which the Secretary of Commerce has responsibility; and the third part contains the appendices. This is the second such report—the first report covered the period from December 21, 1972, through June 21, 1973, was submitted to Congress as required by the Act on July 27, 1973, and to the public on August 1, 1973, (38 FR 20564).

The Act, with certain exceptions, places an immediate moratorium on the taking and importation of all marine mammals and marine mammal products. It makes the Secretary of Commerce responsible for protecting whales, porpoises, seals, and sea lions, and the Secretary of the Interior responsible for all other marine mammals, specifically sea otters, walruses, polar bears, and manatees. On November 30, 1972, the Secretary of Commerce delegated authority for the functions prescribed by the Act to the Administrator of the National Oceanic and Atmospheric Administration (NOAA). On February 9, 1973, the Administrator delegated this authority to the Director, National Marine Fisheries Service (NMFS).

Regulations promulgated or proposed. On August 16, 1973, a notice of proposed rulemaking Governing the Taking and Importing of Marine Mammals, as required by section 112 of the Marine Mammal Protection Act of 1972, was published by NOAA/NMFS in the FEDERAL REGISTER (38 FR 22133). Publication was accompanied by a statement that written comments, views or objections to those proposed regulations could be submitted to the Director, NMFS, during the 45-day period ending October 1, 1973. Final Regulations (Appendix A) were published in the FEDERAL REGISTER on January 15, 1974, and became effective the same date (39 FR 1851). These superseded the Interim Regulations Governing the Taking and Importing of Marine Mammals, which were published in the FEDERAL REGISTER on December 21, 1972, and became effecti e the same date (37 FR 28177); they also reflected the 22 comments on the published proposed rulemaking of August 16, 1973; they corrected certain technical errors and omissions; they deleted reference to regulations implementing the economic hardship provision of the Act, which expired October 21, 1973; and they effected additional changes in the definitions and the prohibitions as a result of the enactment of the Endangered Species Act of 1973 (PL 93-205).

On April 23, 1974, an amendment to the final regulations (Appendix B) was published in the FEDERAL REGISTER (39 FR 14348). It was the intention of NOAA/NMFS to clarify, through that amendment, the procedures to be followed in submitting applications for scientific research and public display permits.

The Marine Mammal Protection Act of 1972 contains specific provisions concerning the incidental take of marine mammals in connection with commercial fishing operations. Section 101(a)(2) of the Act excludes commercial fishermen from permit requirements to take marine mammals in their operations until October 20, 1974. They are, however, subject to interim regulations promulgated under section 111.

Interim regulations under section 111 were proposed on November 12, 1973, (38 FR 31180), (Appendix C) to require tuna purse seiners engaged in the catching and landing of yellowfin tuna to equip their nets with a 2-inch stretch mesh porpoise safety panel, to close hand-hold areas, to tighten cockline hangings, and to use backdown or other release procedures until all live marine mammals are released. These interim regulations were adopted on January 22, 1974, (39 FR 2481), to be effective April 1, 1974, (Appendix D). A shortage of nylon netting brought about by the petroleum shortage delayed implementation of the panel regulation until June 1, 1974. A statement to that effect was published in the FEDERAL REGISTER on March 13, 1974 (39 FR 9684).

Proposed regulations were published April 5, 1974, (39 FR 12356), to implement a general permit system for commercial fishermen, to become effective October 21, 1974, (Appendix E). The proposed regulations were framed around the type of gear utilized by fishermen (five categories) and requiring certificates of inclusion under general permits for each type of gear. The five categories of gear proposed were towed or dragged gear; encircling gear, tuna purse-seining; encircling gear, seining other than tuna; stationary gear; and other gear. Fishermen who do not encounter marine mammals or can avoid taking them do not require permits.

An environmental impact statement was deemed necessary for the promulgation of regulations designed to grant permits to tuna fishermen for the taking of porpoise incidental to the course of their fishing operations. Accordingly a draft environmental impact statment (DEIS) was prepared and issued on April 5, 1974.

Public hearings on the proposed regulations and on the DEIS were held to give interested persons an opportunity to place their views on the record. Hearings on the DEIS will be held in Washington, D.C. on May 7, 1974, and at Terminal Island, California, on May 9, 1974. A formal hearing on the proposed regulations as required by the Act will be held in Seattle, Washington, on May 15, 1974. A decision on these regulations is due on or about June 30, 1974.

Legal actions brought against the Federal Government. During the term covered by this report, three legal actions related to the administration of the Act by the Department of Commerce were filed in the United States District Court for the District of Columbia. These were:

Project Jonah, et al. v. Dent, et al. Filed on June 21, 1973, this action sought to compel the defendants (1) to promulgate interim regulations under section 111 of the Act to reduce the hazards to marine mammals incident to commercial fishing operations, and (2) to prepare and file a report on the current status of all marine mammals subject to the Act as required by section 103(f) of the Act. The suit was dismissed due to mootness on February 4, 1974, reflecting the fact that the regulations and report in question were promulgated and filed as required by the Act.

Fund for Animals, et al. v. Dent. Filed on September 13, 1973, this action sought to enjoin the granting of an economic hardship exemption to the Fouke Company of Greenville, South Carolina, to authorize its importation of fur sealskins from the Republic of South Africa. The plaintiffs requested that the suit be dismissed on September 21, 1973, after the judge had ruled that, among other things, the Secretary was not arbitrary or capricious in issuing the Letter of Exemption.

Friends of Animals, Inc., et al. v. Joseph Blum, et al. Filed on April 15, 1974, this action would in effect require the court to interpret the provision of the Act which prohibits the importation of marine mammals which were "nursing at the time of taking." A judicial decision has not been rendered on the merits of the action.

Impact of Endangered Species Act of 1973 on Marine Mammal Protection Act Administration. The enactment of the Endangered Species Act of 1973 on December 28, 1973, had the following effects on the Marine Mammal Protection Act of 1972:

(a) Amended the references to the Endangered Species Conservation Act of 1969—

(1) By striking out "Endangered Species Conservation Act of 1969" in section 3(1)(B) thereof and inserting in lieu thereof the following: "Endangered Species Act of 1973";

(2) By striking out "pursuant to the Endangered Species Conservation Act of 1969" in section 101(a)(3)(B) thereof and inserting in lieu thereof the following: "or threatened species pursuant to the Endangered Species Act of 1973";

(3) By striking out "endangered under the Endangered Species Conservation Act of 1969" in section 102(b)(3) thereof and inserting in lieu thereof the following: "an endangered species pursuant to the Endangered Species Act of 1973"; and

(4) By striking out "of the Interior such revisions of the Endangered Species List, authorized by the Endangered Species Conservation Act of 1969," in section 202(a)(6) thereof and inserting in lieu thereof the following: "such revisions of the endangered species list and threatened species list published pursuant to section 4(c)(1) of the Endangered Species Act of 1973."

(b) Stated that except as otherwise provided for in the Endangered Species Act of 1973, no provision of the Endangered Species Act of 1973 shall take precedence over any more restrictive conflicting provision of the Marine Mammal Protection Act of 1972.

Congressional oversight hearings. Concerned with the details of the administration of the Act, the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the House Committee on Merchant Marine and Fisheries held oversight hearings at La Jolla, California, and at Anchorage, Alaska, in August 1973, and at Washington, D.C. in January 1974. Testifying at the January hearings, Robert W. Schoning, Director of the NMFS, reported on the progress and problems experienced during the first fifteen months of the administration of the Act.

Marine Mammal Commission. On May 14, 1973, President Nixon announced the appointment of the three-man Marine Mammal Commission provided for under the Act. The Commissioners appointed were:

Victor B. Scheffer, Bellevue, Washington, a marine mammal biologist retired from the United States Fish and Wildlife Service. He serves as Chairman.

A. Starker Leopold, Professor of Zoology, University of California at Berkeley.

John Ryther, Chairman, Department of Biology, Woods Hole Oceanographic Institution, Falmouth, Massachusetts. Mr. Ryther resigned shortly after his appointment. A replacement has not been appointed.

On August 6, 1973, the Marine Mammal Commission announced the appointment of the Committee of Scientific Advisors. The Committee members appointed were:

Dr. George A. Bartholomew
Department of Biology
University of California
Los Angeles, CA 90024

Dr. Douglas G. Chapman
College of Fisheries
University of Washington
Seattle, WA 98195

Dr. Kenneth S. Norris
Division of Natural Sciences
University of California
Santa Cruz, CA 95060

Mr. William E. Schevill
Museum Comparative Zoology
Harvard University
Cambridge, MA 02138

Dr. Jesse R. White
11025 SW 173d Terrace
Miami, FL 33157

Mr. John L. Burns
Alaska Department of Fish & Game
P.O. Box 80746
College, AK 99701

Mr. Jack W. Lentfer
U.S. Bureau of Sport Fisheries & Wildlife
813 D Street
Anchorage, AK 99501

Dr. G. Carleton Ray
Department of Pathobiology
Johns Hopkins University
615 N. Wolfe Street
Baltimore, MD 21205

Dr. Donald B. Siniff
Department of Ecology & Behavioral Biology
University of Minnesota
St. Paul, MN 55101

Title II of the Act which established the Marine Mammal Commission and Committee of Scientific Advisors prescribes extensive consultation roles for the Commission and the Committee with the Secretaries of Commerce and the Interior.

The Commission, not funded until November 1973, nevertheless was consulted as fully as possible in the interim before funding. The Committee of Scientific Advisers first met on January 18 and 19, 1974, to study the review procedures and pending applications. Following the establishment and staffing of Commission offices, the full consultative role prescribed by the Act was implemented. Interface with the Commission is now possible on a daily basis, and formal review of permit applications is accomplished through established procedures. Two other major areas have been the subject of consultation with the Commission in addition to reviewing permit applications—the importation of South African fur sealskins, and commercial fishing operations involving the incidental taking of marine mammals.

PART I. ACTIONS TAKEN TO ASSURE THE WELL-BEING OF MARINE MAMMALS

Economic hardship exemptions. Section 101(c) of the Act and § 216.13 of the interim regulations permitted the Secretary of Commerce to grant relief until midnight, October 20, 1973, by exempting from the moratorium those persons who could demonstrate undue economic hardship. Of the 60 applications submitted for undue economic hardship exemptions, 23 were approved—14 exemptions for the purposes of scientific research, 7 for public display, and 1 each for personal subsistence and importation of sealskins for commercial use. Of the 37 remaining applications, 21 were denied, 13 were withdrawn, and no action was taken on 3 because the applications were incomplete. Appendix F contains an analysis of the economic hardship exemption applications, including the final disposition of each application and the number of marine mammals involved.

Public display and scientific research permits. Section 101(a)(1) of the Act and § 216.31 of the regulations governing the taking and importing of marine mammals authorize the NMFS Director to issue permits to take and import mammals or marine mammal products for scientific research and public display. The criteria to be used by the Director in determining whether to issue a scientific research permit include consideration as to whether the proposed taking or importation is consistent with the policies and purposes of the Act; and whether the granting of the permit is required to further a bona fide, necessary, and/or desirable scientific purpose, taking into account the benefits to the population stock and the marine ecosystem which can be derived from the contemplated scientific research. In determining whether to issue a public display permit, the Director, shall consider—among other criteria—whether the proposed taking or importation is consistent with the policies and purposes of the Act; whether a substantial public benefit will be gained from the display contemplated, taking into account the manner of the display and the anticipated audience as well as the effect of the proposed taking or importation on the population stocks of the marine mammal in question and the marine ecosystem; and the applicant's qualifications for the proper care and maintenance of the marine mammal,

and the adequacy of his facilities. Although the Act declares a moratorium on the taking of marine mammals, the Act clearly intended that research on marine mammals be continued and that public displays (where the health and well-being of the species involved are maintained) be allowed. Permits, however, may be granted only after a review by the Marine Mammal Commission and the Committee of Scientific Advisors.

As of April 30, 1974, 92 applications for scientific research and public display permits have been submitted to the Director, including 41 for scientific research and 51 for public display. Forty-five of these applications, certified as being complete, have been forwarded to the Marine Mammal Commission for consideration. The Commission has submitted recommendations on 31 of them. Twenty applications have been approved, two denied, three referred to the appropriate States (under the provisions of section 109 of the Act), and one withdrawn. Nine applications are awaiting final determination, 13 are pending before the Marine Mammal Commission, 11 are complete and being prepared for submission to the Marine Mammal Commission, 7 are being held pending resolution of administrative policy or legal questions, and 25 applicants have not yet submitted complete applications. In addition, an interagency Letter of Agreement was signed to allow the Smithsonian Institution to collect and utilize certain dead marine mammals (whales, porpoise, seals, and sea lions) for scientific research. Table 1 provides a summary of the applications received and number of animals involved. Tables 2 and 3 provide a breakdown of the number of each species of marine mammal involved in the permit applications. The three applications refered to the appropriate States involved beached and stranded marine mammals. Under section 109(a)(4) of the Act and § 216.22 of the regulations, an employee of a State or local government official is permitted to take possession of beached marine mammals, and the State is permitted to place marine mammals in captivity until such time as they can be returned to their natural habitat.

Although the Act does not require public hearings as a condition to the granting of permits, the regulations provide for such hearings at the discretion of the Secretary. In determining whether to hold a public hearing, the Secretary may consider such factors as (a) whether any interested person has requested a public hearing on such application during the time period set for public comment on the application, (b) the views of the Marine Mammal Commission on the desirability of holding a public hearing, (c) the nature of the application and the number of animals and the species involved, (d) the extent to which a public hearing would facilitate the processing of the application, and (e) applications that have unique aspects which require a major policy decision prior to making a determination on the permit application.

Public hearings were held on four public display applications and one scientific research application. In addition to the specific public display permit application under consideration, one hearing involved the general topic of permitting marine mammals to be taken for use in traveling marine mammal exhibits shown at circuses, carnivals, fairs, schools, and shopping centers. A second hearing, involving a major policy decision, was held to consider the applications of two foreign display facilities and the general topic of permitting marine mammals to be taken for display purposes outside the jurisdiction of the United States. The two other hearings involved the taking of a large number of marine mammals for the purposes of research, and the taking of four killer whales, the latter a subject of great regional interest and controversy.

Hearings are usually held in the geographic area in which an applicant does business or the location of prominent public interest, and a transcript of the hearing is made for the official record. When hearings were necessary, notices of receipt of applications and notice of the hearing were published in the FEDERAL REGISTER, and public comments were solicited.

In addition to public hearings, meetings were held periodically with many interested national conservation groups, including a consortium of environmentalists and others, to explain the problems involved in implementation of the Act as well as proposed solutions. Notices on all policy determinations on permits (Appendix G) and final actions taken thereon, were published in the FEDERAL REGISTER. Records of the four hearings on permit applications are available for inspection at NMFS headquarters in Washington, D.C.

The regulations provide for the charging of a fee to cover the costs of the issuing of a permit. Public display permit holders are assessed a fee of $200 and scientific research permit holders are assessed a fee of $25.00. Such fees are waived for Federal agencies to which permits are issued. A total of $1,100 has been collected from permit holders, which fees are deposited in miscellaneous receipts of the U.S. Treasury.

SYNOPSIS OF PERMIT APPLICATIONS (AS OF APRIL 30, 1974)

Applications received	Scientific research	Public display	Total
Number of applications submitted	[1] 41	51	92
Number of animals requested (total)	[1] 9,896	519	10,415
Of these:			
To be taken and released	8,658	0	8,658
For captive maintenance	127	469	596
To be taken dead	126	50	176
To be killed in taking	965	0	965
To be killed in captivity	20	0	20
Action taken:			
Number of applications withdrawn	0	1	1
Number of applications referred to States	2	1	3
Number of applications handled through interagency agreement	1	0	1
Wumber of applications denied	2	0	2
Number of applications approved	10	10	20
Number of animals approved (total)	623	83	706
Of these:			
For captive maintenance	94	83	177
To be taken and released	483	0	483
To be taken dead	46	0	46
To be killed in taking	0	0	0
To be killed in captivity	0	0	0

[1] Included in the application totals above are 18 applications for "research of opportunity" on dead, beached, or stranded animals, or other research projects in which no numbers of animals are specified. The total number of animals requested, therefore, does not include the animals that would be taken under these applications.

TABLE 2.—*Number of cetaceans requested under permit applications (as of April 30, 1974)*

Common name	Scientific name	Requested					Granted			
		Taken and kept alive	Taken and released	Taken dead	Total	MMC[1]	Taken and kept alive	Taken and released	Taken dead	Total
Gray whale	*Eschrichtius robustus*		5	1	6	6		5		5
Minke whale	*Balaenoptera acutorostra*			3	3	3				
Rough-toothed dolphin	*Steno bredanensis*	7			7	7	7			7
Atlantic bottlenosed dolphin	*Tursiops truncatus*	147	26		173	57	46			46
Pacific bottlenosed dolphin	*Tursiops gilli*	23		3	25	11	8			8
Risso's dolphin	*Grampus griseus*	2			2	2				
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	16	175	3	194	104		97		97
Dusky dolphin	*Lagenorhynchus obscurus*		11		11	11		11		11
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	4			4	4				
Spinner dolphin	*Stenella longirostris*	17			17	17	11			11
Spotted dolphin	*Stenella attenuata*			3	3	3				
Common dolphin	*Delphinus delphis*	3	110	3	116	116	3	110		113
Northern right-whale dolphin	*Lissodelphis borealis*	2		3	5	3				
Pygmy killer whale	*Feresa attenuata*	4			4	4				
False killer whale	*Pseudorca crassidens*	5			5	3	3			3
Pilot whale	*Globicephala macrorhyncha*	16	20	2	38	25	5	20		25
Killer whale	*Orcinus orca*	6		3	9	7				
Harbor porpoise	*Phocoena phocoena*			3	3	3				
Dall's porpoise	*Phocoenoides dalli*			3	3	3				
Beluka (beluga) whale	*Delphinapterus leucas*			15	15					
Pygmy sperm whale	*Kogia breviceps*			3	3	3				
Arch-beaked whale	*Mesoplodon carlhubbsi*			3	3	3				
Goose-beaked whale	*Ziphius cavirostris*	2			2	2				
Total		253	347	52	652	401	83	243		326

[1] These figures indicate the number of each species requested in applications which have been forwarded to the Marine Mammal Commission.

TABLE 3.—*Number of pinnipeds requested under permit applications (as of April 30, 1974)*

Common name	Scientific name	Requested					Granted			
		Taken and kept alive	Taken and released	Taken dead	Total	MMC[1]	Taken and kept alive	Taken and released	Taken dead	Total
South American sea lion	*Otaria flavescens*	5			5	5	5			5
California sea lion	*Zalophus californianus*	281	30	33	344	132	57			57
Steller sea lion	*Eumetopias jubatus*		3,000	163	3,163	3				
Northern fur seal	*Callorhinus ursinus*			3	3	3				
Pacific harbor seal	*Phoca vitulina richardii*	59	660	493	1,212	236	7	20		27
Ice-breeding harbor seal	*Phoca vitulina largha*		300	30	330					
Atlantic harbor seal	*Phoca vitulina vitulina*	1			1	1				
Northwest Atlantic harbor seal	*Phoca vitulina concolor*	25	25		50	13	1			1
Ringed seal	*Pusa hispida*			95	95	25			25	25
Gray seal	*Halichoerus grypus*	28			28	24	22			22
Ribbon seal	*Histriophoca fasciata*			40	40					
Bearded seal	*Erignathus barbatus*			50	50	10			10	10
Hawaiian monk seal	*Monachus schauinslandi*	2			2	1				
Crabeater seal	*Lobodon carcinophagus*		300	30	330	330			6	6
Ross seal	*Ommatophoca rossi*		100	9	109	109			1	1
Leopard seal	*Hydrurga leptonyx*	2	100	26	128	128	2		2	4
Weddell seal	*Leptonychotes weddelli*		3,500	50	3,646	3,646		220	2	222
Northern elephant seal	*Mirounga angustirostris*	10		1	11	11				
Southern fur seal	*Arctocephalus australis*		100	8	108	108				
Southern elephant seal	*Mirounga leonina*		100	8	108	108				
Total		363	8,311	1,089	9,763	4,903	94	240	46	380

[1] These figures indicate the number of each species requested in applications which have been forwarded to the Marine Mammal Commission.

Applications for waiver of the moratorium. Section 101(c) of the Act provides, during the first year following enactment, for the granting of an undue economic hardship exemption from the importation restrictions imposed by the Act. The Fouke Company, Greenville, South Carolina, applied for permission to import 70,000 raw sealskins, and received a letter of exemption on the basis of undue economic hardship. The exemption allowed the importation of up to 50,500 raw skins from the southern fur seal from South Africa. The proposed action was the subject of an environmental impact statement. The granting of the permit was challenged in a court action to obtain a restraining order to preclude importation. The court denied the plaintiff's request for a temporary restraining order and 42,075 skins were imported. Due to transportation problems and the October 21, 1973, expiration date of the exemption, the remaining 8,425 skins could not be imported.

An application for waiver of the moratorium to allow the continued importation of sealskins from South Africa by the Fouke Company is under consideration. A DEIS was issued on April 18, 1974. A representative of the NMFS visited South Africa in September 1973 followed by a two-man team in March 1974 to review the program to determine whether it is adequate to meet the purposes and intent of the Act. A third visit will be made in July 1974 to review harvesting procedures.

Under the provisions of section 109 (a)(2) of the Act, and § 216.4(b) of the regulations promulgated thereunder, any State may adopt laws or regulations relating to the taking or protection of any species or population stock of marine mammals if the Secretary determines, after review by law, that such laws or regulations will be consistent with the provisions of the Act and the regulations. For a State to adopt laws or regulations relating to the management of marine mammals, the Secretary must waive the application of Section 101 of the Act (i.e., the moratorium provision).

The State of Alaska has applied to the Secretary to have the marine mammal regulations of the Alaska Department of Fish and Game declared consistent with the Act and regulations and to allow the State to resume management of sea lions, phocid (hair) seals, and belukha whales. A similar request has been made of the Secretary of the Interior with respect to management of walrus, sea otter, and polar bear. The NMFS and the Bureau of Sport Fisheries and Wildlife (Interior) have formed

a joint working group to review the State regulations and prepare a working paper leading to a DEIS. The DEIS will discuss the impact on the environment of all takings of marine mammals from waters off Alaska, the alternative approaches to management of these mammals, and the short-term versus long-term use and productivity of the environment (waters off Alaska).

Although representatives of Washington, Oregon, and California have discussed possible return of management of certain marine mammals to their respective jurisdictions, no formal requests for waivers have been received from States other than Alaska.

Research programs—Tuna/porpoise research and development. The marine mammal program at the NMFS Southwest Fisheries Center (SWFC) is concerned with oceanic porpoise populations and their relation to the tuna fishery. The major objectives of the program are to carry out NMFS responsibilities in response to the Marine Mammal Protection Act of 1972, especially in respect to sections 101(a)(2), 103(b), (d) and 111, and to contribute to the long-term maintenance of the tuna fishing industry through conservation of the sea's natural resources.

Program design has been guided by the general philosophy, priorities, and organizational structure outlined in the "Report of the NOAA Tuna-Porpoise Review Committee" of September 1972. Accordingly, the first task is to reduce the porpoise mortality and serious injury rate that is incidental to tuna purse seining as rapidly as possible, the secondary goals are (1) to generate baseline biological data on porpoise populations in the eastern tropical Pacific, and (2) to establish the status of these populations. The two major components of the NMFS program are gear dynamics and development, and biology and stock assessment. (The Committee of Scientific Advisors has been requested to prepare a detailed estimate of the numbers of mammals killed or seriously injured under existing commercial fishing technology.)

All facets of the research program have been developed in close cooperation with other involved groups such as the tuna industry and the Departmental Porpoise Review Committee. As noted above, the first planning for research organization was based on findings of the Tuna-Porpoise Review Committee, composed of a cross-section of persons from industry, government, and universities. The gear dynamics and development program, although managed from the Southwest Fisheries Center at La Jolla, California, is essentially based on the input and expertise of specialists from the Northwest Fisheries Center (NWFC) at Seattle, Washington. Contracts have been let to experts at the University of California at Santa Cruz and San Diego, and the Naval Undersea Center, San Diego, to conduct behavioral and acoustical studies to determine the feasibility of aerial assessment. Workshops at quarterly or more frequent intervals have been held at the SWFC with industry, state, and university participants for the purpose of reviewing the existing program and for eliciting opinions concerning the proposed programs.

Analysis of historical data indicates that a high incidence of porpoise mortality occurred during a small percentage of hauls, most generally at times when the cork lines of a purse seine have come together and the net has "collapsed." The gear dynamics and development program is investigating other gear malfunctions such as net roll-up equipment failures that result in time delays, and unfavorable environmental conditions.

Short-time remedies must require minimum modification to take advantage of existing equipment and limited training when they are used. Suggested solutions are the use of anti-torque cable as a purse line to reduce net roll-ups; use of speed boats as tugs to hold nets open at the time of incipient collapse; and current indicators and related devices to aid in the most advantageous placement of nets relative to wind and current.

The techniques discussed were developed on two experimental cruises in Pacific waters. Preliminary results of recent testing and evaluation on the fishing grounds are highly encouraging.

Extensive porpoise kills can occur when large numbers of tunas and porpoise are captured and crowded together in the net. To alleviate this condition, a modified tuna purse seine has been designed and built. This net is approximately the same length as the seines now in use, but lighter webbing tapered to a greater depth is used to provide an increased area which can safely contain large catches of fish and porpoises. A porpoise safety panel with smaller-than-normal mesh, (1½-inch stretch mesh) is provided in the backdown area of the net. In the "backdown" procedure, maneuvering of the vessel causes the section at the back of the pursed net to dip beneath the surface of the water, allowing porpoises to escape. Tests of the new net on the fishing grounds resulted in a very low porpoise kill recorded in 24 successful sets in which 500 tons of tuna were caught.

At a series of workshops sponsored by the American Tuna Boat Association in San Diego, industry representatives and fishermen have participated in discussions and consultations about the gear program, and have collaborated in conducting fishing tests and evaluations of corrective techniques. Reduction in kill rates of porpoises achieved to date are due largely to innovations developed by the fishermen and to their increased efforts to "backdown" and rescue all possible animals. NMFS gear research has, however, progressed to the point where methods and techniques considered to hold high potential such as those described above, can contribute to further reductions in porpoise mortality.

For descriptive purposes the biology and stock assessment program that the Fisheries Service is pursuing can be divided into four functionally related parts encompassing observers, basic biology, stock assessment and population dynamics, and assessment surveys.

The observer program so far has provided most of the vital information on porpoise-tuna interactions. Under the provisions of the Marine Mammal Act of 1972, NMFS observers who go to sea aboard U.S. tuna purse seiners count porpoises killed during the fishing operations and record data relative to these mortalities, make detailed observations of the rescue operations during each tuna set, collect specimens and samples to be used for life history studies and stock assessment, and make other observations on cetaceans and birds. A statistical evaluation indicated that 25 to 38 trips would be necessary during 1974 to obtain valid information. Previously, observer trips had been negotiated on an individual basis. For the 1974 season, however, the fleet was stratified into five size-age classes and the numbers of trips in each class apportioned on the basis of their past relative importance in the fishery. Twenty-two observer trips were made during the 1973 fishing season.

Boats to carry the observers were selected by means of a random drawing. Industry cooperation in placing observers on these specific boats has been excellent, and apparently will provide data on approximately 1,000 sets on porpoises, representing about 15 to 20 percent of all such sets made by U.S. purse seiners operating in 1974 in the Inter-American Tropical Tuna Commission Yellowfin Regulatory Area of the eastern Pacific.

The observer trips yield relatively precise information on the numbers of porpoises killed in making these sets.

The trend of all indices of fleet performance (kill per set, kill per ton of yellowfin tuna, percentage kill of porpoises captured in the net, and the proportion of sets that resulted in high kill) continues downward, indicating improvement. The significance of this trend is presently being assessed.

Basic biological work is essentially a continuation of existing studies of taxonomy, geographic distribution, growth, reproductive rates, and the major causes of natural mortality among delphinid species of the eastern tropical Pacific. The essential data are obtained from specimens and samples resulting from commercial tuna fishing and constitute the greatest mass of information that has yet been gathered on oceanic porpoises. Results of the work will contribute to population dynamics models. When work on the species of primary importance, the spotted porpoise (*Stenella attenuata*), is near completion, emphasis will shift to the spinner porpoise (*Stenella longirostris*). Several scientific manuscripts have recently been finished that treat such subjects as gestation period and fetal growth, age determination, length-weight relationships, geographical variation, a comparative study of stomach contents of porpoises and tunas, and the ecological relationships among birds, porpoises, and tuna. Further data inputs have been provided by the aerial and ship surveys conducted in early 1974. Porpoise stock

assessment studies are designed to reveal: Current status of spotted porpoise stocks; projections of these stocks under present procedures used in the tuna fishery; and projections of the stocks under alternative management strategies and proposed changes in gear technology. Additional studies will extend these considerations to the spinner porpoise and the white-belly porpoise.

Heretofore most of the data on the density and distribution of eastern tropical Pacific porpoises has been obtained in conjunction with commercial fishing. Because the data thus obtained tends to be limited to areas of high porpoise density, it is essential that surveys also be made from platforms that traverse predetermined ocean tracks across the Commission Yellowfin Regulatory Area. A feasibility study completed under contract to the University of California (San Diego) indicated that while a high-altitude, long-range, aerial photo-reconnaissance may have been possible, the costs would have been far beyond program resources. Instead, a combined ship-aerial assessment survey was conducted in January-February 1974. A twin-engined, amphibious aircraft carrying four NMFS observers flew at low altitudes over section of the tuna fishing area seaward to about 500 miles while a research ship with three NMFS observers aboard used tuna scouting techniques to cover sections more distant from land.

The results of these surveys are now being analyzed to produce density estimations of porpoise stocks in conjunction with observations made routinely by the porpoise observers aboard the fishing vessels. Other indices such as quantifiable evidence of changes in porpoise behavior and catch per unit of effort are being examined.

In summary, the major products of the porpoise research program through 1974 will include the following:

1. Fishing methods and gear that can reduce the incidental porpoise mortality in the U.S. tuna purse seine fishery and are exportable to foreign fleets.
2. Estimates by species of the distribution, densities, and subdivisions of the porpoise populations vulnerable to the tuna fishery in the eastern tropical Pacific.
3. An assessment, by species, of the impact of projected mortality levels on the porpoise stocks.
4. Final estimates, by species, of the numbers of porpoises killed in 1970, 1971, 1972, and 1973.
5. Preliminary estimates, by species, of the numbers of porpoises killed in 1974.

Coordinated Pribilof Island-Bering Sea research. The research control area study on St. George Island (Pribilof Islands, Alaska) is designed to investigate the relationship between survival and abundance and to further investigate the parameters determining present population levels of the northern fur seals on the Pribilof Islands. The study was deemed necessary when management procedures, initiated in 1956, did not produce an anticipated increase in harvestable 3–4 year old male fur seals. All commercial sealing was halted on St. George in 1973, and the island seal population was set aside to serve as a "natural" unharvested population (control area) to compare with the population of St. Paul Island, which is harvested annually.

Under a general research plan, the St. George study is estimated to require a minimum of at least 10 years. During the first few years, the major research effort will be directed toward testing field methods and acquiring baseline data on the fur seal populations and their interactions with other marine resources. In subsequent years the herds will be monitored to determine density-dependent changes in the population and to investigate the effects of management through comparison with the harvested populations on St. Paul Island.

In later stages, the study will involve intensive investigation of the long-term effects of no commercial harvest on the St. George population. Supportive studies will be made of fisheries in the Bering Sea, and fur seal metabolism, physiology, and disease as those factors affect survival rates.

The program consists of coordinated land and pelagic studies. Land research activities concentrate primarily on comparative studies of the unharvested and harvested populations and include documentation of population abundance and composition, changes in growth and reproductive rates, behavior, density-dependent behavioral modifications, changes in sex ratio, and determination of factors affecting survival rates.

Pelagic studies include identification of major offshore feeding areas and prey species as well as investigations of the feeding behavior of lactating females at sea by means of radio or sonic tags, and analysis of food chain dynamics. The same females will also be observed on land.

Accomplishments. (June 22, 1973, through April 30, 1974). To date, 675 fur seals have been collected within a 20- to 100-mile radius of the Pribilof Islands. The purpose of this collection was to locate major feeding areas, determine food species, and increase the information base for determining age-specific pregnancy and ovulation rates.

Major food species were determined to be walleye pollock, squid, deep-sea smelt, and Greenland turbot.

Preliminary behavioral observations and baseline counts were made from an observation tower constructed on St. George Island and from observation blinds during the first season of the harvest ban on the island. The 1973 pup population was estimated at approximately 60,500, and 5,000 pups were marked.

Initial studies were conducted on holding fur seals in temporary captivity for studies on reproductive rates. Captive animals were observed to breed in captivity.

Five hundred females were marked for further behavioral observations. Aerial photographic records were made for definition of rookery areas. Japanese and Canadian scientists accepted invitations to collaborate in radio-telemetry and pelagic studies.

Law enforcement. The NMFS Marine Mammal enforcement activities have been strengthened by the recruitment of additional enforcement personnel in the Washington and regional office. This increase in personnel has enabled the NMFS to make a more adequate and timely response to such problems as reports of alleged violations, inspection of importations of marine mammals and marine mammal products, and monitoring capture activities by permit holders. Approximately one-fourth of the time spent by the NMFS in enforcement and surveillance activities is directly related to marine mammals.

During fiscal year 1974, the NMFS entered into cooperative enforcement agreements with 10 States along the Pacific, Atlantic, and Gulf coasts. Cooperative enforcement agreements with Alaska, Washington, Oregon, California, South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana now afford enforcement services which assist and complement NMFS efforts at a total monthly cost of approximately $37,000. The determination of contract expense depends primarily upon the degree of State effort employed in supplementing NMFS enforcement capability to a level deemed sufficient for purposes of the Act.

Essentially, these cooperative agreements provide for enforcement of provisions of the Act by designated State officers, utilizing State equipment, and working within State jurisdiction. Acting as Federal law enforcement agents under provisions of the agreements, State Officers are charged with enforcement of (a) the moratorium on the taking of marine mammals; (b) the prohibition against the possession, transportation, sale, or the offering for sale of illegally taken marine mammals or marine mammal products; and (c) the terms and conditions of letters of exemption or permits issued by the NMFS Director.

In addition to the direct enforcement activities required of the states, the agreements require State Officers to notify NMFS enforcement agents or agents of other Federal agencies of the disposition of beached or stranded marine mammals. During an 8-month period in 1973, 833 separate incidents were reported, including beachings, strandings, reports of suspected violations, monitoring of holding facilities, and other activities requiring official action by a State under terms of enforcement agreements.

Reporting procedures have been developed and implemented which provide the information necessary for review and assessment by NMFS of State performance under terms of the agreements as provided by the Act. These evaluations are used to determine potential problem areas, effectiveness of programs, and future objectives of NMFS-State cooperative enforcement programs.

Some specific examples of enforcement actions carried out by State and NMFS enforcement personnel include:

Investigations of numerous complaints alleging violations of the Marine Mammal Protection Act resulted in the referral of 21 cases for administrative or judicial action within the period covered by this report.

Three cases involving the possession of sealskins contrary to Act provisions, and another concerning the taking and possession of a Minke whale skeleton were completed in the Northeast Region.

The ownership of six porpoises seized by NMFS enforcement agents in the Southeast Region, was transferred to the Service as a result of administrative action in four cases. The disposition of one other civil action and one criminal charge are pending.

In the Southwest Region, two cases were initiated under Marine Mammal Act provisions: In the Northwest Region, three cases involving the taking and possession of harbor seals and one concerning the possession of a sea lion hide were successfully concluded.

Five cases, three concerning the harassment of marine mammals by commercial fishermen, and two concerning the taking and possession of harbor seals in violation of Act provisions, were completed by administrative action in the Alaska Region.

The NMFS held individual and informal meetings with several State agencies regarding enforcement of the Act. Such meetings were held throughout the year as the need occurred. Other town-hall type meetings were held with the fishing industry and the local citizenry. Information on the Act, including how it would affect the industry, was presented.

A cooperative agreement between NMFS and Bureau of Sport Fisheries pertaining to enforcement of the Act has been proposed and it is presently awaiting acceptance by BSF&W. The agreement will provide an exchange of authority, allowing one agency to enforce the law and regulations that are the responsibility of the other.

A verbal agreement reached with the U.S. Customs Service last year continues in effect. This agreement provides for Customs personnel to make the initial interception of contraband products. Once so identified, the Customs Service alerts NMFS, which follows through and initiates proceedings against any person or item identified as in violation. Items held up by Customs and subsequently found to be lawful imports are passed for importation.

Inquiries have been made of the Department of Agriculture to identify areas of mutual concern relative to management and enforcement of the Act. Further negotiations will deal with cooperative arrangements concerning captive animals, their condition, and the suitability of their confinement conditions.

International program. As required in section 108(a)(6) of the Act, a separate report (39 FR 12051) was presented to Congress by the Secretary of Commerce detailing the implementation of the international program under the Act from October 21, 1972, to October 19, 1973.

At the Annual Meeting of the Inter-American Tropical Tuna Commission (IATTC) in Washington, D.C., November 12–16, 1973, the U.S. Delegation distributed copies of the proposed interim regulations for U.S. tuna fishermen designed to reduce the incidental take of marine mammals. The main points in the regulations, including the embargo provisions, were outlined. Also, the Director of Investigations of the IATTC informed the member nations that the United States has formally requested him, by letter, to make recommendations to all Commission members regarding the use of fishing methods and gear which the available research indicates is effective in reducing incidental marine mammal mortality and serious injury rate. When the regulations come into effect, foreign nations must certify that species of fish being imported have been taken with fishing technology which does not result in serious injury or death to marine mammals in excess of U.S. standards.

The NMFS marine mammal expert who visited South Africa in September 1973 to observe the harvest of Cape fur seals reported that the major sites for harvesting of South African fur seals are in South West Africa (Namibia). Discussions with the Department of State have resulted in the conclusion that a bilateral international agreement on the conservation of South African fur seals is, therefore, not possible. The Department of State advised that any agreement with South Africa relating to fur seals would be in violation of the U.N. Security Council Resolution 301 which ". . . calls upon all States . . . to abstain from entering into treaty relations with South Africa in all cases in which the Government of South Africa purports to act on behalf of or concerning Namibia."

A meeting was held with Soviet marine mammal scientists in Washington, D.C., in December 1973, to discuss coordination of marine mammal research efforts by United States and Soviet Scientists. Tentative agreements reached were that (1) scientific data and statistics would be exchanged, (2) scientists studying certain species of marine mammals would visit their counterparts in the other nation, and (3) U.S. scientists would participate in a Soviet whale tagging and research cruise in the Pacific in the fall of 1974. Species particularly mentioned for exchange of data and program coordination are gray and bowhead whales, various species of ice seals, belukha (beluga) whales and northern sea lions.

NOAA–NMFS is cooperating with the National Science Foundation in preparation of an Environmental Impact Statement for the Convention on the Conservation of Antarctic Seals. Once the procedures connected with this Statement have been completed, and if the Convention is found acceptable, the Convention will be sent to the U.S. Senate for ratification. A recent survey of the nations that participated in the negotiating conference shows that all twelve have signed the Convention, South Africa and Norway have ratified it, and four others, including the United States, have plans for ratification by the end of this year.

Continuing international efforts to improve the scientific information base included a four-nation joint cruise for marking and sighting of large whales in the Indian Ocean. Results of the research are not yet available, but a total of 472 large whales, including Minke, and 109 smaller cetaceans were sighted. A total of 167 large whales, mostly sperm, were marked. Diving and respiratory behavior also were studied.

The Sub-Committee on Small Cetaceans of the Scientific Committee of the International Whaling Commission (IWC) met in Montreal, Canada, April 1–12, 1974. Several U.S. marine mammalogists participated in this meeting and presented papers. The Canadian Government convened the meeting and will publish, with support from other countries, more than 40 scientific papers given at the meeting. The papers will be made available to the Scientific Committee of the IWC in June 1974.

Scientific activities of the Food and Agriculture Organization (FAO) in regard to marine mammals are progressing. The first meeting of the large whale group of the FAO Advisory Committee on Marine Resources Research (ACMRR) Working Party on Marine Mammals will be held in Morges, Switzerland, during the second week of May 1974. The report of this independent group will be available to the IWC Scientific Committee.

Part II. Current Status of the Stocks of Marine Mammals

Introduction. Of the approximately 104 species of marine mammals throughout the world, status reports have been prepared for 66 species which are of primary concern to the United States and are the responsibility of the Secretary of Commerce under the terms of the Marine Mammal Protection Act. The Act requires a report not only on the status of each marine mammal species, but also on the population stocks. The population stocks of only a few marine mammals have been delineated and the effort needed to obtain information on most population stocks is beyond the scope of research being carried out at the present time.

Information about each spices is summarized under six major headings. They are distribution and migration, abundance and trends, general biology, ecological problems, allocation problems, and current research. Selected references are listed at the end of each species discussion. Summary information on existing protective regulations for marine mammals is also included.

References are not cited in the report except for the paragraph on abundance and trends. Because of the importance of data on abundance and trends, information in this section is cited and citations are given in the list of references. Data on the abundance of marine mammals are difficult and costly to obtain. With the exception of a few species which have been commercially exploited, such as large whales and fur seals in the North Pacific Ocean, abundance data are usually inadequate for management purposes.

A list of scientists who have assisted either by providing information or reviewing the status reports is included in the report. Revised status reports were prepared for those species for which new information has become available since the July 1973 report to Congress. Such revised reports are indicated within the species list by an asterisk.(*)

SPECIES LIST

Pinnipedia
- *Zalophus californianus* (California sea lion).
- *Eumetopias jubatus* (northern sea lion).
- *Arctocephalus australis* (South American fur seal).
- *Arctocephalus pusillus* (South African fur seal).
- *Arctocephalus townsendi* (Guadalupe fur seal).
- *Callorhinus ursinus* (northern fur seal).
- *Phoca vitulina* (harbor seal).
- *Pusa hispida* (ringed seal).
- *Halichoerus grypus* (gray seal).
- *Histriophoca fasciata* (ribbon seal).
- *Pagophilus groenlandicus* (harp seal).
- *Erignathus barbatus* (bearded seal).
- *Monachus tropicalis* (Caribbean monk seal).
- *Monachus schauinslandi* (Hawaiian monk seal).
- *Lobodon carcinophagus* (crabeater seal).
- *Ommatophoca rossi* (Ross seal).
- *Hydrurga leptonyx* (leopard seal).
- *Leptonychotes weddelli* (Weddell seal).
- *Cystophora cristata* (hooded seal).
- *Mirounga leonina* (southern elephant seal).
- *Mirounga angustirostris* (northern elephant seal).

Mysticeti
- *Balaena glacialis* (black right whale).
- *Balaena mysticetus* (bowhead whale).
- *Eschrichtius robustus* (gray whale).
- *Balaenopteria acutorostrata* (minke whale).
- *Balaenopteria edeni* (Bryde's whale).
- *Balaenopteria borealis* (sei whale).
- *Balaenoptera musculus* (blue whale).
- *Balaenopteria physalus* (fin whale).
- *Megaptera novaeangliae* (humpback whale).

Odontoceti
- *Steno bredanensis* (rough-toothed dolphin).
- *Tursiops truncatus* (bottlenosed dolphin).
- *Grampus griseus* (Risso's dolphin).
- *Lagenorhynchus albirostris* (white-beaked dolphin).
- *Lagenorhynchus acutus* (Atlantic white-sided dolphin).
- *Lagenorhynchus obliquidens* (Pacific white-sided dolphin).
- *Lagenodelphis hosei* (Sarawak dolphin).
- *Stenella attenuata, frontalis, graffmani,* and *dubia* (spotted dolphin).
- *Stenella plagiodon* (Atlantic spotted dolphin).
- *Stenella longirostris* (spinner dolphin).
- *Stenella coeruleoalba* (striped dolphin).
- *Delphinus delphis* (common dolphin).
- *Lissodelphis borealis* (northern right whale dolphin).
- *Peponocephala electra* (broad-beaked dolphin).
- *Feresa attenuata* (pygmy killer whale).
- *Pseudorca crassidens* (false killer whale).
- *Globicephala melaena* (common pilot whale).
- *Globicephala macrorhyncha* (short-finned pilot whale).
- *Orcinus orca* (killer whale).
- *Phocoena sinus* and *Phocoena phocoena* (harbor porpoise).
- *Phocoenoides dalli* (Dall propoise).
- *Delphinapterus leucas* (beluga) (belukha).
- *Monodon monoceros* (narwhal).
- *Physeter catodon* (sperm whale).
- *Kogia breviceps* (pygmy sperm whale).
- *Kogia simus* (dwarf sperm whale).
- *Mesoplodon bidens* (North sea beaked whale).
- *Mesoplodon europaeus* (Antillean beaked whale).
- *Mesoplodon mirus* (True's beaked whale).
- *Mesoplodon stejnegeri* (Bering Sea beaked whale).
- *Mesoplodon carlhubbsi* (Arch-beaked whale).
- *Mesoplodon ginkgodens* (Ginko-toothed whale).
- *Mesoplodon densirostris* (dense-beaked whale).
- *Ziphius cavirostris* (goose-beaked whale).
- *Berardius bairdi* (giant bottlenose whale).
- *Hyperoodon ampullatus* (North Atlantic bottle-nose whale).

CALIFORNIA SEA LION

(*Zalophus californianus californianus*)

Distribution and migration. This subspecies of the California sea lion ranges along the west coast of Mexico from about lat. 21° N to southern British Columbia, Canada. The California sea lion breeds on some Gulf of California islands northward to San Miguel Island, California, in lat. 34° N. Many adult and subadult males move northward along the California, Oregon, Washington, and British Columbia coasts after the breeding season. Feral animals in the southeastern U.S. (including the Gulf of Mexico) which have escaped from captivity are reported, but there is yet no evidence for breeding (Caldwell, D.K., pers. comm., 1974).

Another subspecies occurs on the Galapagos Islands, and still another, formerly found in Japanese waters, is now extinct.

Abundance and trends. The California Department of Fish and Game censuses indicate that the California sea lion population reached a low level in the early 1930's in California waters, then made a steady recovery and apparently leveled off about 1961 with little variation in the counts since then (Ripley, Cox, and Baxter, 1962; Carlisle and Aplin, 1971). Rice, Kenyon, and Lluch (1965) counted 16,150 California sea lions on Guadalupe, San Benito, and Cedros Islands, Mexico, in January and February 1965. Orr, Schonewald, and Kenyon (1970) counted this species in the Gulf of California between 1960 and 1968, and in April 1966 made what is the most accurate total counts (5,411) obtained on six islands in these waters. Odell (1971) obtained minimum counts of 34,382 California sea lions on all Channel Islands in June 1964. Carlisle and Aplin (1966) obtained a total count in California of 22,000 animals in 1965, using aerial photography. In United States waters, Peterson and LeBoeuf (1969) estimated that 40,000 animals were ashore on San Nicolas and San Miguel Islands during the 1967 and 1968 breeding seasons. The preceding figures indicate a total population of about 60,000, with near 20,000 animals in Mexico and 40,000 in the United States.

Mate (pers. comm.) states that the California sea lion population in Oregon numbered about 2,500 in 1968, 1969, and 1970. As many as 1,000 animals migrated through Oregon to the north during these years.

In 1972, Bigg (1973) counted 430 California sea lions in Barkley Sound off Vancouver Island on 25 February. At the same time, 35 on Race Rocks off Victoria, B.C., and 10 in Dodds Narrows (lat. 49° 07′ N.) near Nanaimo, B.C., were counted.

Before passage of the Marine Mammal Protection Act by the U.S. Congress, California sea lions were taken by permit each year for sale to zoos, oceanaria and circuses. Daugherty (1972) states that 400 of these animals were taken in 1969 and 580 in 1970.

General Biology. The adult male grows to 2.1 m and 273 kg; the adult female to 1.8 m and 91 kg. Most of the pups are born in June and are about 0.8 m long and 5.4 to 6.4 kg in weight. The females usually breed 15 to 30 days after parturition and the mother and pup may remain together the first year. The males establish and defend breeding territories on land; the females move about freely. On San Nicolas Island, the pupping season begins about 15 May and lasts about 5 weeks, with the peak during the first week in June.

During the past two or three years an increase in premature births and in the mortality rate of subadults and young adults apparently has occurred. Three potential causes have been isolated: (1) Chemical residues (polychlorinated biphenyls, DDT and metabolices); (2) a bacterium (*Leptospira*); and (3) a virus.

The greatest single cause of death in wild and captive animals is lungworm. Animals in captivity have also died from pleuropneumonia, pneumonia, and enteric infections, diseases which may also occur in wild populations.

Ecological problems. California sea lions because of industrial and land development and possible harassment have practically abandoned certain hauling grounds and rookeries. Although most major populations are now located on sites not easily reached by the public, a few areas such as Monterey Bay breakwater in Monterey, California, are used extensively as hauling grounds by California sea lions and are visited frequently by tour boats.

Allocation problems. A history of conflict exists between people for and against complete protection of this species. Some fishermen want the number of California sea lions to be controlled. California sea lions are probably the most widely sought-after species of eared seals in the world for public display. Some conservation groups would like complete protection for the California sea lion.

Current research. The following organizations are conducting research on the California sea lion: Biological Sonar Laboratory, Fremont, California; University of California, Santa Cruz, California; University of California, Berkeley, California; California Academy of Science,

* Status of Stocks revised as of April 30, 1974.

San Francisco, California; Humboldt State College, Arcata, California; and Fisheries Research Board of Canada, Nanaimo. The National Marine Fisheries Service conducts research on this species incidental to a fur seal project on San Miguel Island off California.

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NORTHERN (STELLER) SEA LION

(*Eumetopias jubatus*)

Distribution and migration. The northern sea lion is found in continental shelf water from the Sea of Japan and northern Honshu, Japan, northward around the North Pacific Ocean rim to the Okhotsk and Bering Seas and southward to the California Channel Islands. Some seasonal movements occur in parts of its range. Examples of such movements are differences in the winter and summer distribution of these animals in the Bering Sea, and the post-breeding movements in central California.

Abundance and trends. Kenyon and Rice (1961) estimated the world population at between 240,000 and 300,000 in 1961. No published estimates of the total population have been made since that time. Alaska has 202 known rookeries and hauling grounds. The Alaskan population has increased considerably since the early 1900's and now exceeds 200,000 and may be near maximum levels in many areas (Alaska Department of Fish and Game, 1973). Since 1964, several thousand pups have been harvested annually in Alaska until 1973 when the Marine Mammal Protection Act became effective; 6,546 were taken in 1972.

Kenyon and Scheffer (1962) made six aerial and one surface survey along the Washington coast between 1949 and 1959 and stated that the population did not exceed 500. Pearson and Verts (1970) estimated the Oregon population at 1,078. The California Department of Fish and Game makes periodic aerial censuses of sea lions in California. Carlisle and Aplin (1971) have given the following figures for sea lions in California north of Pt. Conception: (1958) 7,053; (1961) 6,675; (1965) 4,998; (1969) 7,156; and (1970) 5,189. They consider these to be northern sea lions, although small numbers of California sea lions are known to occur north of Pt. Conception at the time the census is made.

The northern sea lion ranges to the Channel Islands group south of Pt. Conception. In the Channel Islands, the population peaked at about 2,000 in the late 1930's and has declined since (Bartholomew, 1967). In 1972, the San Miguel Island population was estimated by De Long (pers. comm.) at 30 to 35 plus a few pups.

General Biology. The adult males grow to 3.0 m in length and over 900 kg in weight. The adult females reach 2.0 m and almost 300 kg. Newborn pups weigh 16 to 23 kg. The pup sheds its dark chocolate birthcoat for the tan adult pelage in the autumn of birth. Males may mature sexually by age 5 years, but hold breeding territories first at age 7 or 8. Females can first produce young at age 5 or 6, and breed 10–14 days after parturition. Some pups remain with their mothers the first year. The adult male maintains a territory 40 to 60 days, and the female is aggressive towards other females for several days after her pup is born. Northern sea lions favor isolated locations with some shelter, free access to the sea, and freedom from human harassment. Colonies may become established on rock outcrops, boulder, cobblestone, and coarse sand beaches. The northern sea lion feeds on a variety of fish and cephalopods.

Ecological problems. Northern sea lions in some areas may compete with other pinnipeds for rookery and hauling ground space. Excessive disturbance by humans of sea lions on their rookeries and hauling grounds has caused the animals to abandon these areas.

Allocation problems. Northern sea lions have damaged gear and destroyed fish in the halibut longline, salmon purse seine, gillnet, and troll fisheries. In recent months, the Alaska Department of Fish and Game has received increasing numbers of gear damage complaints from fishermen with respect to the northern sea lion (J. Vania, pers. comm., 1974). The species has also destroyed herring in herring pots and has been accused of biting and sinking inflated plastic buoys used to mark crab pots. This species has considerable esthetic and recreational value.

Current research. This species has its center of abundance in Alaska where the Alaska Department of Fish and Game's management and research investigations have been directed primarily at determining abundance and distribution, and the effects of harvesting operations on rookery populations. The University of California, Santa Cruz, is also conducting research on the species off California.

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South American Fur Seal

(*Arctocephalus australis*)

Distribution and migration. Two major populations of the South American fur seal, identifiable only by size, are found, one on the Falkland Islands (Islas Malvinas) and the other on coastal Uruguayan Islands. Minor populations of this species occur in Argentina, Chile, and Peru. The adults are on the Uruguayan breeding grounds in November and December, and offshore up to 200 miles east on the edge of the continental platform during the austral winter. An extreme northern record for the South American fur seal was of one identified at Rio de Janeiro, Brazil.

Abundance and trends. In 1972, the Uruguayan population was estimated at 252,000. This population grew from an estimated 129,000 in 1960 to an estimated 174,000 in 1965. Other populations are also increasing. Information on abundance and trends was furnished by Isaias Ximénez, Uruguayan Government biologist.

General biology. Adult males on the Falkland Islands grow to 159 kg, whereas those in Uruguay reach only 136 kg; the females weigh 33–48 kg. Males are polygamous and establish territories in early November. Most of the pregnant females arrive on the rookeries in mid-November, and form small harems of about six animals. Within 6–7 days, each female bears a single pup and breeds 2–3 days later. The pup is usually weaned by July, although some may nurse for nearly a year. Most males first breed at age 7 and the females at age 3. Uterine implantation of the blastocyst probably occurs in March. Gestation, including the period of delayed implantation, lasts nearly one year. Most of the animals leave the rookeries during the austral winter. On the rookeries, the fur seals are in close contact with South American sea lions, *Otaria flavescens*. Main causes of death in order of importance are from sporadic storms, which wash large numbers of pups out to sea; the seven-gilled shark; and probably the killer whale, which is common around the larger rookeries. The South American fur seal has 10 species of endoparasites, but no heart or lung worms. Nasal mites infest this species.

Ecological problems. Offshore oil wells are planned in the near future which may result in an ecological hazard.

Allocation problems. The species has esthetic, educational, and economic values. The Government of Uruguay annually harvests male fur seals on the islands. The harvest in 1972 was 11,000 and in 1973 will be 12,500.

Current research. Long-term research on this species is carried out by the Governments of Uruguay and Argentina. In addition, short-term projects are carried out by the Natural History Museum of Montevideo and the Smithsonian Institution.

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South African (Cape) Fur Seal

(*Arctocephalus pusillus*)

Distribution and migration. The South African fur seal breeds on the mainland and coastal islands of southern Africa from Cape Cross (South West Africa) to Algoa Bay (South Africa). This species shows no definite seasonal migration, but disperses widely while feeding. A marked adult was seen in deep-sea trawling grounds 450 miles from its birthplace. Young seals in their first year (November to October) frequent protected bays and areas near their places of birth.

Abundance and trends. No current data are available on the total South African fur seal population, however, Rand (1972) estimates about 19,500 mature territorial males and about 273,000 mature females on mainland and island rookeries. Commercial sealing now appears to be keeping the population fairly stable (op. cit.). First year pups (about 9 months) and a small (unknown) number of second year animals of either sex are harvested in the winter (June–September), although all cow seals are protected (op. cit.). In 1950, the winter harvest totaled 27,289 pups and has increased to 76,694 in 1971 (Laws, in press). The summer kill of surplus adult males (October–December) has declined from 3,000 in the early 1950's to 812 in 1969 (Rand, 1972).

General biology. The adult males weigh 204.2–317.6 kg and grow to 2.3 m long; females weigh 90.7–113.4 kg and are 1.5–1.8 m. long. In late October, when most of the older pups are weaned, the first adult males come ashore to establish territories and harems; pregnant females arrive about a week later. In November and early December, the female bears a single pup (twins are rare), mates 5–6 days later, then leaves its pup for the first time and feeds for 1–2 days at sea. Subsequent nursing-feeding cycles extend to 4–5 days on land and 7–10 days at sea. Implantation of the blastocyst in the uterus is delayed until April or May. Thus, gestation is 7–8 months, but may be longer for some females that mate for the first time in their second year. At birth the pup is about 0.76 m long and averages 6.4 kg. Food consists of fish, cephalopods, and various small crustaceans.

The South African fur seal has stomach nematodes, a cestode and an acanthocephalan in the intestine, mites in the nasal cavity and pulmonary tubes, and an ectoparasitic louse.

Ecological problems. Sharks and killer whales are natural predators.

Allocation problems. Local fishermen engage in scattered and illegal killing of seals, contending that the animals interfere with their expanding purse-seine fishery. Seals occasionally feed on fish protruding through the meshes of otter trawl nets or taken by line fisheries.

Current research. A marking program on some rookeries is carried out by the South and South West African governments to measure herd size, annual recruitment, natural and harvest mortality, and movements.

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Guadalupe Fur Seal

(*Arctocephalus townsendi*)

Distribution and migration. This distribution of *A. townsendi* in the 18th and 19th centuries is unknown. The Guadalupe fur seal was believed extinct during two periods (1895–1926; 1928–49). One adult male was observed on San Nicholas Island in 1949, and breeding animals were rediscovered at Guadalupe Island in 1954. Subsequently, individual animals have been reported at Cedros Island, Baja California, and others have been sighted on San Miguel Island each year since 1968.

Abundance and trends. The last Guadalupe fur seal was commercially harvested from the islands of southern California and Baja California in 1894. The populations of Guadalupe for seals on the Guadalupe and San Benito Islands apparently once numbered in the thousands. Rice et al. (1965) counted 285 of these mammals on Guadalupe Island and suggested that the population was growing rapidly and may contain as many as 600 animals, including those in the water.

General biology. Biological information on this species is scarce. No specimens have been collected since their recent rediscovery. The males are almost 1.8 m long. Males appear somewhat smaller and females considerably larger than *Callorhinus ursinus*. *A. townsendi* can be separated from *C. ursinus* by its narrow, pointed muzzle and the extension of pelage beyond the wrist onto the dorsum of the foreflipper. It is separated from *Zalophus californianus* by its distinctive underfur.

The pups are born in June and July. Although breeding has not been observed, a post partum estrus probably occurs, which would extend the breeding period into August. The adult males establish territories in isolated caves that have access to the sea or among large boulders close to the splash zone. Single or small groups of breeding territories are distributed along 20 km of the eastern shoreline of Guadalupe Island. The harems contain 1–10 females.

The feeding habits of *A. townsendi* are unknown. The adult males apparently spend considerable time at sea; all sightings at other islands have occurred during the nonbreeding season. The females may not migrate long distances from Guadalupe Island.

Ecological problems. Increasing numbers of human visitors to Guadalupe Island are subjecting the animals to more disturbance. Plans exist to develop the island for the tourist trade. Such development would increase disturbance and could reduce the amount of available breeding habitat for fur seals. Because they breed only on Guadalupe Island, the seals need complete protection from undue disturbance and habitat modification.

Allocation problems. None known.

Current research. The University of California makes periodic censuses of this species.

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Northern Fur Seal

(*Callorhinus ursinus*)

Distribution and migration. Most of the animals are on their breeding grounds from May through November to bear young and to breed. They otherwise are found at sea along the Continental Shelf from the Bering Sea south along both sides of the North Pacific Ocean to latitude 32° N. Some intermingling of eastern and western Pacific populations occurs at sea and on land, primarily among males younger than age 6 years.

Abundance and trends. Beginning in 1956, a program of reducing the population of Pribilof Islands fur seals was begun with the expectation that the rate of survival would improve (Roppel et al., 1963) and result in an increased yield of pelts. By 1968, it had become evident that the herd had been reduced to a level somewhat below that of maximum sustainable yield, and that an increase in the number of pups born was desirable. Thus, no female fur seals have been harvested in the Pribilof Islands since 1968 with the expectation that the population would increase. However, less than average survival of several year classes, the cause of which is not understood, has prevented the expected increase. In 1973 the number of pups born was estimated to be 381,000 (unpublished data, Marine Mammal Division), and in the past the maximum yield of furs was produced when about 400,000 pups were born. In the 1969–72 period when no females were commercially harvested on the Pribilof Islands, an average of about 37,500 males were taken. In 1973, 28,457 males were harvested on St. Paul Island; fur seals were not harvested on St. George Island in 1973.

Apparently the Commander Islands fur seals have not become reestablished on a considerable portion of their original rookery area. Consequently, this population should increase to a higher level. It is likely that the Robben Island population is near the maximum. Johnson (1972) estimates the abundance of northern fur seals by breeding islands, as follows:

Location of fur seal rookeries	*Estimated number of northern fur seals (in thousands)*
Pribilof Islands	1,200
San Miguel Island	<1
Commander Islands	265
Robben Island	165
Kuril Islands	15
Total	1,645

General biology. The adult male weighs 227–318 kg, and the female 36–59 kg. Newborn pups average 4.5 (female) to 5.4 kg (male). The male is polygamous and establishes his territory in late May and early June. Most of the pregnant females arrive on the rookeries in late June and early July, when they form harems of 1–100 animals. Within 3 days of her arrival, the female bears a single pup (twins are rare), breeds 2 days later, then begins nursing-feeding cycles of 2 days on land and about 8 days at sea within a 200-mile radius. Implantation of the blastocyst is delayed until November. Most of the males first breed at age 10, and few live longer than 15 years. Immature fur seals arrive in descending order of age, the males beginning in mid-June and the females in late July. Some 1-year-olds haul out in September and October, but most fur seals return first at age 2. Most of the animals have left the rookeries by December. The adult males winter in northern waters, pregnant females usually migrate as far south as southern California, and young animals of both sexes are found throughout that range.

The main causes of death among pups on the rookeries are, in order of importance: Emaciation-malnutrition syndrome, hookworm disease, bacterial infections, injuries, and perinatal hemorrhagic syndrome. Pathogenic bacteria thus far isolated include: *Clostridium perfringens*, *Proteus mirabilis*, *Salmonella enteriditis*, and *Leptospira* sp. A psittacosis group virus has been reported, but the clinical syndrome caused by the

agent has not been described. Three other virus isolates from diseased fur seal pups are presently being characterized.

The fur seal has filariid worms, stomach ascarids, intestinal flukes, cestodes, hookworms, and acanthocephalans, and nasal mites, but no heart or lung worms. Hookworms and sucking lice parasitize the newborn.

Ecological problems. Northern fur seals concentrate within their body tissues contaminants such as pesticides and heavy metals. For example, mercury compounds have been found in fur seal liver, large quantities of which have been eaten by residents of the Pribilof Islands. No evidence exists that consumption of fur seal liver has been a health hazard, but following the discovery of mercury in this organ, little liver has been eaten by the people. The effect of contaminants on the health of fur seals is unknown.

Allocation problems. In the North Pacific Ocean and Bering Sea, fur seal and commercial fisheries may be in competition for the same species of fish. Harvesting of fur seals on the Pribilof Islands has been criticized in recent years by animal protection organizations that would prefer esthetic and educational rather than economic use of the resource.

Current research. Long-term research is financed and carried out by the Governments of Japan, Canada, the U.S.S.R., and the United States. Short-term projects are frequently carried out on the Pribilof Islands by university professors or graduate students.

In 1973 St. George Island was designated by the North Pacific Fur Seal Commission as an area of intensive research where no commercial harvest would take place for some period of years. An expanded research program on St. George Island and in the Bering Sea was started in 1973.

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Harbor Seal

(Phoca vitulina)

Distribution and migration. The harbor seal is found in the North Atlantic Ocean from the ice pack south to France and Georgia and in North Pacific Ocean waters from the Arctic Ocean south to Baja California and southern Japan and Korea. Populations that breed on the ice in the Bering and Okhotsk Seas are distinct from those that breed on land. *P. v. largha,* the ice-inhabiting form, lives in the seasonal pack ice in winter and spring, bearing and nurturing its pup there, and moves toward the coast when the ice retreats. The costal forms (*P. v. richardii* and *P. v. kurilensis* in the North Pacific; *P. v. vitulina* and *P. v. concolor* in the North Atlantic) are more sedentary. The harbor seal is the predominant near-shore seal in ice free waters north of 35° N. latitude.

Abundance and trends. Overall, the world population of harbor seals appears to be high and stable. About 750,000 are present in the North Pacific area (Alaska Department of Fish and Game, 1973; Bigg, 1969; Chapskii, 1966) and about 150,000 in the European North Atlantic region (Chapskii, 1966).

General biology. Harbor seals of all subspecies are of medium size; large adults of both sexes are from 160 to 180 cm long and weigh from 130 to 150 kg. Pups weigh from 9 to 12 kg and are about 80 to 90 cm long at birth. Adults of the ice-inhabiting form pair in March for the duration of the breeding season, and a white-coated pup is born to each pair, on the ice, usually in March or April. Adults of the coastal form congregate on islets and bear dark-coated pups, usually in May to July. The pups of each form nurse 4 to 6 weeks, in which time the weight is more than doubled. Males of both forms become sexually mature at 4 to 5 years of age; females at 3 or 4 years. Breeding is annual, and the period of pregnancy (including delayed implantation) is about 10.5 months. Maximum longevity is at least 35 years. Adults of both forms are gregarious outside the breeding season. The diet of the harbor seal, which varies according to season and location of specific populations, includes primarily pelagic, demersal, and anadromous fishes, cephalopods, and crustaceans. Almost all of the adult seals have anisakid round worms and corynosomid acanthocephalans, and, occasionally, high infestations of anopluran lice. The latter seem associated with filarial heart worms and may be vectors. Toxoplasma has been reported in captive animals, but its presence in wild seals is not verified.

Ecological problems. In some parts of its range, the harbor seal contributes to high worm infections in fish, notably codfish. This animal is extremely sensitive to disturbance, and may leave an area temporarily or even permanently after continual harassment by people, equipment, or aircraft. Contamination of the environment with pesticides, heavy metals, and other contaminants may be a problem for the land-breeding harbor seal because it frequently inhabits the relatively closed waters of bays and estuaries where these contaminants are likely to concentrate.

Allocation problems. These seals damage commercial fishing gear and compete with man for such fish as herring, smelt, whitefish, and salmon.

According to the Alaska Department of Fish and Game, hunting and the harvest of the harbor seal by Indians, Aleuts, and Eskimos have declined markedly during the past year because of a reduced market for salable products from these species. In southeastern Alaska, the decreased harvest has resulted in additional conflicts between the habor seal and the fishermen.

Current research. Ongoing research in California, Washington, British Columbia, Alaska, the U.S.S.R., and Japan is aimed toward the identification of North Pacific populations and describing their distribution and movements, reproductive biology, feeding habits, growth, physiology, and ecology.

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Ringed Seal

(*Pusa hispida*)

Distribution and migration. The ringed seal is circumarctic in distribution in the ice pack. In the North Pacific Ocean it is found in the Bering, Chukchi, and Okhotsk Seas and in the permanent ice pack of the Polar Basin. In winter, most ringed seals occupy areas of land-fast ice, but nonbreeding adults and juveniles may be found wherever ice occurs. Apparently, animals wintering in the Bering and Chukchi Seas move northward in spring as the ice recedes and southward in autumn as it advances again, whereas those in the Canadian Arctic may reside year-round in the same locality. In western Alaska, the ringed seal is the dominant near-shore seal during months when sea ice is present and is replaced by the harbor seal during ice-free months. A small proportion of the population, mainly juveniles, remains in ice-free areas of the Bering Sea during summer.

Abundance and trends. Counts of ringed seals on land-fast ice along the northern coast of Alaska made in 1970 (Burns and Harbo, 1972) indicated that the density of resident animals varies from 5.36 per square mile in the Chukchi Sea between Point Lay and Wainwright, to 1.06 per square mile in the Beaufort Sea between Oliktok and Flaxman Island. Overall, the population in the Bering and Chukchi Seas appears high and is probably stable. Estimates of population size made by the Soviets are difficult to evaluate because they recognize three subspecies with overlapping ranges. The Soviets estimate that the total population of *P. hispida* is 5 to 6 million (Chapskii, 1966); *P. h. hispida* (North Atlantic and Arctic Oceans) at 2,500,000; *P. h. kraschenini-kovi* (western Bering Sea) at 12,000 (Shustov, 1969); and *P. h. ochotensis* (Okhotsk Sea) at 800,000 to 1,000,000 animals (Fedoseev, 1969, from Bychkov, 1971). The Alaska Department of Fish and Game (1973) estimates the Bering-Chukchi Seas population at about 250,000 ringed seals. The total U.S.-U.S.S.R. harvest is estimated at 12,000 to 16,000 seals annually in the Bering and Chukchi Seas. Almost all of these seals are taken by shore-based hunters because the animals are not numerous in areas where Soviet sealing vessels operate.

General Biology. The ringed seal is the smallest of the northern seals. The adults of both sexes grow to about 125 cm and 66 kg. A few individuals, usually females, become much larger. The animals undergo marked seasonal changes in weight, being heaviest in mid- to late winter. The pups are born with white coats from March to early April in a birth lair within an ice pressure ridge or under drifted snow. Newborn animals are 55 to 65 cm long and weigh about 4.0 kg. The weight of the pup is tripled during a 4- to 6-week nursing period. Males become sexually mature at 6 to 8 years of age, females at 5 to 7 years. The ringed seal breeds annually, has a 10.5-month period of pregnancy (including delayed implantation), and is probably monogamous. Maximum longevity exceeds 35 years. Ringed seals tend to be solitary but congregate in areas favorable for feeding, along extensive tide cracks in land-fast ice, and during seasonal migrations. The diet of these seals varies considerably, depending on their location and water depth. In western Alaska, this mammal feeds mainly on mysids, amphipods, euphausids, shrimps, saffron cod, polar cod, and sculpin.

These animals commonly have internal parasites, including round worms, acanthocephalans, and anopluran lice.

Ecological problems. None known.

Allocation problems. According to the Alaska Department of Fish and Game, hunting and the harvest of the ringed seal by Indians, Aleuts, and Eskimos have declined markedly during the past year because of a reduced market for salable products from these species.

Current research. The State of Alaska monitors the Eskimo harvest and conducts some biological research in conjuction with other programs. Canada conducts research on the ringed seal.

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Gray Seal

(*Halichoerus grypus*)

Distribution and migration. The gray seal inhabits the North Atlantic Ocean, with major populations in eastern Canada, Iceland, and northwestern Europe. Dispersion, particularly by pups, from the Canadian breeding colonies in late spring and summer presumably accounts for most of the gray seals seen scattered along the coast of Maine. The tendency for adults to disperse is far less, although they at times make pronounced local movements. One animal tagged in eastern Canada was recently taken off western Norway.

Abundance and trends. The world population is estimated at 50,000 to 60,000 animals, with about two-thirds of these animals in the British Isles (Bonner, 1972). All populations have been increasing until recently, but now appear to be stabilizing (op. cit.). A small colony of 10–15 animals was recently discovered on Muskeget Island, Massachusetts.

General biology. The average length of adult males is 2.4 m and of females, 2.0 m. The average weight and length of the newborn pups are 13.6 kg and 0.9 m, respectively. Pups of the Canadian and Baltic populations are born mostly in February, whereas those in Britain are born mostly in September–October. At birth the pups are covered with a white natal coat, which is replaced by one of stiff hair with a distinctive pattern after 3 to 4 weeks. The pups are weaned in about 3 weeks, at which time mating occurs. The adult seals feed chiefly on skates, mackerel, flounders, cod, hake, and herring; and occasionally salmon, smelt, haddock, sea bass, dogfish, squid, and crustaceans.

Ecological problems. People occasionally harass the animals and use them for target practice.

Allocation problems. In eastern Europe they compete for commercial fishes and destroy fishing gear, and in Canada, the gray seal is an important predator of inshore herring taken commercially.

Current research. Research on biology, ecology, and populations continues by Canadian and British Governments and private groups. Some work is also being carried out by the University of Massachusetts on Muskeget Island and by the State of Maine.

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Ribbon Seal

(*Histriophoca fasciata*)

Distribution and migration. Geographically, the ribbon seal is separable into the Okhotsk and Bering-Chukchi Seas populations, and interchanges between these two groups are not known to occur. In the latter group, the center of abundance is in the central Bering Sea. The ribbon seal bears and nurtures its pup on the sea ice. During winter and spring, the entire population is concentrated along the southern edge of the seasonal ice pack. Only a few ribbon seals remain with the ice edge as it retreats northward through Bering Strait. In summer and autumn, ribbon seals are believed to be pelagic, mainly in the ice-free Bering Sea.

Abundance and trends. The population of ribbon seals is relatively low and has been markedly reduced by commercial sealers of the Soviet Union during the last 10 years (Alaska Department of Fish and Game, 1973). U.S. citizens harvest very few ribbon seals. The Alaska Department of Fish and Game (1973) estimates that the population probably does not exceed 100,000 animals, and Soviet estimates indicate a population of 80,000 to 90,000. Commercial hunting by the USSR has reduced the population of these seals, but measures have been taken to limit the annual harvest. In Alaska, the harvest is usually less than 250 per year.

General biology. Adults of both sexes average 155 cm in length and 80 kg in weight. A very large 23-year-old female obtained in March was carrying a near-term fetus. This seal was 179.7 cm long with a girth of 114.3 cm, a blubber thickness of 6.1 cm, and a weight of 148.2 kg. Pups are born as whitecoats from late March to mid-April and average about 10.0 kg and 80 cm. The pup nurses for about 4 weeks, in which time its weight is tripled. Males become sexually mature between 3 and 5 years of age; females between 2 and 4. The species breeds annually, and pregnancy (including delayed implantation) probably lasts 10.5 months. Maximum longevity is estimated at 26 years. The diet of these seals during late winter and early spring (in the ice edge zone) includes mainly pelagic and demersal fishes, cephalopods, and small crustaceans.

Ribbon seals host anisakid round worms in the stomach and corynosomid acanthocephalans in the intestine.

Ecological problems. None known.

Allocation problems. None known.

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Harp Seal

(*Pagophilus groenlandicus*)

Distribution and migration. The harp seal occurs in pack ice in the North Atlantic Ocean from Europe to eastern Canada. In the spring, it migrates south for breeding to the White Sea, to the Greenland Sea north of 73° N, and to southern Labrador, northeastern Newfoundland, and the Gulf of St. Lawrence.

Abundance and trends. Three breeding stocks of harp seals are known, the eastern (White Sea), central (Norwegian Sea around Jan Mayen Island), and western (Newfoundland). The latter is divided into two substocks, one east of Belle Isle on winter pack ice drifting southward—the "Front," and the other in the southern Gulf of St. Lawrence on winter ice formed *in situ*—the "Gulf." Sergeant (1973) estimates the total eastern Canadian population at 1.3 million. The number of pups born decreased from about 400,000 in 1960 to 300,000 in 1970. The population size in 1970 was less than that giving maximum production, and estimates indicated the 1970 catch was well in excess of the sustainable yield (International Commission for the Northwest Atlantic Fisheries. 1971. Redbook, Part I, Standing Committee on Research and Statistics Proceedings, annual meeting). According to Bychkov (1971), harp seal stocks of the northeastern Atlantic and Arctic Oceans (White Sea, Jan Mayen Island, and Newfoundland populations) numbered 3.0–3.5 million in the mid-20th century. Bychkov (1971) also stated that the White Sea population totaled 3.0–3.5 million animals in 1926–28 and only 400,000 in the 1960's.

In 1971 the International Commission for the Northwest Atlantic Fisheries banned seal hunting in the Gulf of St. Lawrence from large vessels and from aircraft and set a quota of 150,000 harp seals for the hunt off Newfoundland and Labrador by Canadian and Norwegian nationals.

General biology. The adults grow to about 1.8 m and 180 kg; newborn pups are about 0.6 m long and weigh 4.5 kg. The pups are born from late January to early April, and are nursed for 10–12 days. Molting is complete at 4 weeks. The females mature at age 4–6 years and bear a single pup annually after a gestation of about 7½ months. Maximum life span is about 30 years. Pups feed primarily on small pelagic crustaceans and small fish, and in addition as adults on capelin, herring, and haddock.

Ecological problems. One species of helminth affecting the harp seal also is found in the muscles of ground fish, particularly cod, necessitating expensive removal by hand.

Allocation problems. The harp seal may eventually conflict with man over capelin stocks as this fishery expands.

Current research. Canadian, Danish, Norwegian, and Soviet Government scientists are studying the population of harp seals. At the University of Guelph, scientists are studying the biology of this mammal.

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Bearded Seal

(*Erignathus barbatus*)

Distribution and migration. The bearded seal is found in the North Pacific region in the Bering, Okhotsk, and northern Japan Sea and is circumpolar in the Arctic Ocean. In winter and spring it is found from the southern edge of the seasonal ice pack, north to permanent ice, wherever areas of broken, moving ice exists. During summer and autumn, it occurs along the edge of the permanent polar ice of the Arctic Ocean. Marked seasonal migrations are associated with the advance and retreat of the seasonal

ice. The bearded seal is usually solitary, though very loose aggregations are sometimes observed during the breeding season. It does not normally come ashore.

Abundance and trends. All populations seem to be at high levels and relatively stable. A Soviet estimate places the population at 450,000 animals in the East-Siberian, Chukchi, Bering, Okhotsk, and Japan Seas (Bychkov, 1971). The Alaska Department of Fish and Game estimates a population of 300,000 animals in the Bering, Chukchi, East-Siberian, and Beaufort Seas (Alaska Department of Fish and Game, 1973). The combined U.S. and Soviet harvest in the Bering and Chukchi Seas is 8,000 to 10,000 seals per year, well within the biological productivity of this species. Hunting loss, however, is high (op. cit.).

General biology: The bearded seal is the largest phocid of the western arctic and subarctic. Some adult females are slightly larger than adult males. Large adults attain a winter weight in excess of 340 kg. From June through September the adults weigh from 215 to 240 kg and average 236 cm in length. The female bears a single pup, usually during late April or early May, which weighs about 31 kg and is 132 cm long. The pup's weight is tripled by the end of the 12- to 18-day nursing period. Most adult females breed within 2 weeks of weaning their pup. The period of pregnancy is 10.5 months, including 2.5 months of delayed implantation. Some females ovulate at age 3 years, but reproductive maturity is not attained until they are 5 or 6 years old. The males become sexually mature at 6 or 7 years. An estimated 85% of the adult females become pregnant each year. The bearded seal consumes several species of invertebrates, principally crabs, shrimp, clams, and amphipods, and some demersal fishes.

Most bearded seals, other than nursing pups, are heavily parasitized by anisakid round worms in the stomach, acanthocephalans and diphyllobothriid cestodes in the intestine, and anopluran lice on the skin.

Ecological problems. The bearded seal is the final host for anisakid worms that infect fishes, but this problem is unimportant in Alaska at present. About 1% of these animals harbor *Trichinella spiralis*, the cause of trichinosis in man.

Allocation problems. None known. Bearded seals consume commercial important pandalid and crangonid shrimps and lithode crabs; however, they do not compete directly for commercial fishes, nor do they damage fishing gear.

Current research. None known.

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CARIBBEAN MONK SEAL

(*Monachus tropicalis*)

The Caribbean monk seal is classified as endangered in the Red Book of the International Union for the Conservation of Nature. From 17 to 29 March 1973, the Bureau of Sport Fisheries and Wildlife, Department of the Interior, conducted an aerial survey of this species' former habitat in the Gulf of Mexico and Caribbean Sea. The conclusion was that the Caribbean monk seal is now extinct.

It formerly inhabited shores and islands of the Greater Antilles, Bahamas, Yucatan Peninsula, and Florida Keys. It was reported in Jamaican waters as late as 1952. A single pup was born, probably in alternate years. The adults grew to 2.4 m in length. The color was a uniform brownish gray above; the underparts were pale yellow or yellowish white. Monk seals were vulnerable to hunters because they were sluggish, unwary, and not easily alarmed.

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HAWAIIAN MONK SEAL

(*Monachus schauinslandi*)

Distribution and migration. The Hawaiian monk seal breeds only on French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, and Midway and Kure Atolls of the Leeward Hawaiian Islands. The first four of these islands are within the Hawaiian Islands National Wildlife Refuge (HINWR). Rarely do individuals wander southeastward to the main Hawaiian Islands. The species is not known to have a migratory pattern.

Abundance and trends. The total population was estimated at 1,350 in 1958 (Rice, 1960). It is classified as rare by the Office of Rare and Endangered Species, Bureau of Sport Fisheries and Wildlife, and International Union for Conservation of Nature and Natural Resources. Counts in the 1960's and 1970's suggest that the population is declining (Kenyon, 1972).

General biology. An adult female measured 2.3 m and her estimated weight was 273 kg. On the average, females outweigh adult males. A typical male is about 2.1 m long and weighs about 173 kg. The newborn pups weigh 16–17 kg. The weights of six yearlings averaged 45 kg. Pups are born from late December to July, with the peak in April and May. Spewings found on haul-out areas included the remains of reef and bottom fishes, eels, and cephalopods.

Ecological problems. Harassment of the monk seal by humans and dogs on Midway and Kure Atolls may be causing a problem by preventing these animals from using sheltered dry pupping areas. Sharks are a serious predator.

Allocation problems. None known.

Current research. The HINW Refuge Manager, Bureau of Sport Fisheries and Wildlife, has a pup tagging and recovery program in progress. The Refuge Manager also makes counts of animals on the beaches of the HINWR, usually in the spring and again in late summer. No studies or observations of the small populations on Midway and Kure, under U.S. Navy and U.S. Coast Guard control, are being made.

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CRABEATER SEAL

(*Lobodon carcinophagus*)

Distribution and migration. The species is circumpolar and abundant in pack ice of the southern oceans. It is found as a straggler in New Zealand, Australia, Tasmania, and South America. It moves toward the coasts in summer and away from land in the winter.

Abundance and trends. The crabeater seal is the most abundant species of seal in the Antarctic, with population estimates ranging from 2 to 5 million (Scheffer, 1958) to 50–75 million (Erickson, et al., 1971). Laws (in press) believes that the latter estimate is unreliable, but that earlier estimates were too conservative.

General biology. Adult males grow to 260 kg in weight and 2.6 m in length. Some females may be larger than males. Little information is available on breeding habits; mating has not been observed but sperm are present in the testes of males in October and November. Pups are born in the spring (mid-September to early November), and are about 1.4 m long. These seals molt in January and February, while partly fasting. Food is mainly euphausids. Many individuals carry scars, possibly from leopard seal or killer whale attacks.

The species has lice on skin, roundworms in the stomach, and, rarely, tapeworms in the intestine.

Ecological problems. None known.

Allocation problems. None known.

Current research. The University of Minnesota is studying population dynamics of Antarctic seals; the University of Idaho is studying abundance, distribution, and reproductive biology; and the University of Oklahoma is studying anatomy, histology, and neuroanatomy.

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ROSS SEAL

(*Ommatophoca rossi*)

Distribution and migration. The species is circumpolar in heavy pack ice of the Antarctic Ocean.

Abundance and trends. The Ross seal is usually solitary. Scheffer (1958) lists the population at 20,000–50,000 but more recently Hofman et al. (in press) have estimated a population in excess of 100,000.

General biology. The adults reach a length of about 2.4 m. The animal is plump, with a short, wide head, a small mouth, and small teeth. The vocalizations of this mammal are striking and account for the common name "singing seal." Little is known of its reproduction and newborn pups have never been seen. The male matures at 3–4 years, and the female at 2–7 years. Breeding probably takes place in November and molting probably in January and February. Food consists primarily of fish and cephalopods. These animals may live up to 12 years.

Roundworms are found in the stomach, tapeworms in the intestine, and lice on the skin.

Ecological problems. None known.

Allocation problems. None known.

Current research. The University of Minnesota is studying the population dynamics of Antarctic seals; the University of Idaho is studying abundance, distribution, and reproductive biology; and the University of Oklahoma is studying anatomy, histology, and neuroanatomy.

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LEOPARD SEAL

(*Hydrurga leptonyx*)

Distribution and migration. Leopard seals are circumpolar in Antarctic pack ice and in southern temperate regions and subantarctic islands in the winter. They are occasionally seen off the southern tips of New Zealand, Australia, South America, and South Africa.

Abundance and trends. The leopard seal is a solitary animal. Scheffer (1958) estimated the population at 200-300 thousand. More recently (1972), Laws (in press) estimated the population at 250,000 to 500,000.

General biology. The adult males grow to 3.0 m in length and 450 kg in weight; adult females reach 3.3 m in length and 500 kg in weight. Leopard seals have a long slim body, large head, and wide gape. Males are sexually matured at 3–7 years and females at 2–6 years. The mating period is probably in November. Newborn pups are 1.6 m long and weigh 29.5 kg. Lactation lasts about 2 months. The seals molt during January and February. Their food consists of fish, euphausids, squids, penguins, whale carcasses, and pups of other seals.

Leopard seals suffer from diseased teeth, tumors, bony nodules in nasal passages, and stomach carcinomas.

Ecological problems. None known.

Allocation problems. None known.

Current research. The University of Minnesota is studying population dynamics of Antarctic seals; the University of Idaho is studying abundance, distribution, and reproductive biology; and the University of Oklahoma is studying anatomy, histology, and neuroanatomy.

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Weddell Seal

(Leptonychotes weddelli)

Distribution and migration. This species is circumpolar in fast ice around Antarctica, occasionaly reaching as far north as Uruguay (lat. 35° S). It is littoral in distribution and nonmigratory. Because of its occurrence near scientific stations it is the best known of the Antarctic seals.

Abundance and trends. The population was estimated at 800,000 by Scheffer (1958), and Laws (in press) estimates present total population at 250,000 to 500,000.

General biology. Adult males grow to 2.7 m in length and females are slightly larger; up to 2.9 m in length. Males reach sexual maturity at 6–8 years and females at 3 years. The average age of breeding females is 9 years. They give birth from September to early November on fast ice, usually close to the Antarctic continent. Pregnancy lasts 9 to 10 months. Newborn pups are 1.5 m long, weigh 29 kg, and have permanent dentition. Lactation lasts 6–7 weeks and pups are weaned at 6 weeks. The females protect their pups and are aggressive toward intruders. This species feeds primarily on fish and cephalopods.

Wounds inflicted on this mammal heal slowly, and festering sores are common. Kidney stones and uterine fibroids have been found. Weddell seals are heavily infested with tapeworms, trematodes, and roundworms internally, and lice externally. Tooth wear associated with maintaining breathing holes may be a mortality factor.

Ecological problems. None known.

Allocation problems. None known.

Current research. The University of Minnesota is studying population dynamics of Antarctic seals; the University of Idaho is studying abundance, distribution, and reproductive biology; and the University of Oklahoma is studying anatomy, histology, and neuroanatomy.

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Hooded Seal

(Cystophora Cristata)

Distribution and migration. The hooded seal occurs mainly in the east Greenland pack ice from Bear Island and Spitzbergen to Jan Mayen, Iceland, and Denmark Strait. It also occurs off southern Greenland, southeastern Labrador, and the Gulf of St. Lawrence. Stragglers appear on the American coast as far south as Cape Kennedy, Florida, along the Canadian Arctic coast as far west as Hershel Island, and on the European coast as far south as the Bay of Biscay, France. Hooded seals prefer deep water and thick, drifting ice floes.

Abundance and trends. Hooded seals of all ages are harvested commercially when the animals are congregated for molting. According to Scheffer (1958), the herds in the middle of the 20th century were estimated at 300,000 to 500,000 and according to Chapskii (1966) 500,000. Sergeant (1965) states that the catch rate of hooded seals has been high. The average annual kill from the Jan Mayen Island herd declined from about 53,000 (1949–53) to about 40,000 (1959–63) (Popov, 1967).

General biology. Adult males grow to 2.7–3.0 m and 408 kg; females are slightly smaller. Hooded seals are solitary, but form widely scattered family groups during the breeding season in March. The pups are born from the end of March to the first part of April, are 1.1 m long and weigh 23 kg, and have an exceptionally beautiful silver-gray coat. They are nursed about 2 weeks. Both sexes mature at age 4–6 years and have a maximum life span of about 30 years. The adults mate when the lactation period ends and return to sea, leaving the pups on the ice where they remain an additional 2 weeks before following the adults. According to King (1964) hooded seals feed on octopus, squid, rosefish, herring, capelin, cod, shrimp, mussels, and starfish.

Ecological problems. None known.

Allocation problems. None known.

Current research. Research on the hooded seal is carried out by the Fisheries Research Board of Canada, Denmark (Grønlands Fisheriundersøgelser), Norway (Fiskeridirektorates Havforsknings Institutt), and the Soviet Union (VNIRO).

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Southern Elephant Seal

(Mirounga leonina)

Distribution and migration. The southern elephant seal is circumpolar on subantarctic islands, south to the ice edge at lat. 78° S. It breeds on the continental coast of Argentina, and on subantarctic islands.

Abundance and trends. The population of the southern elephant seal has been estimated at 600,000±100,000 (Laws, in press). This species was once sought for its oil. It was nearly extinct by 1900, but since that time regulations have allowed the herds to increase. At South Georgia the average annual kill between 1952 and 1964 was 6,000 animals. There has been no commercial sealing there since 1964, although licenses to harvest these animals have been offered (Laws, in press).

General biology. The southern elephant seal is the largest pinniped. Males grow to 5.5–6.1 m in length and 3,628 kg in weight; females reach 3.1–3.7 m and 907 kg. Males are sexually mature at 4 years, and hold harems at 5–7 years in utilized populations. The females mature at age 2 years and bear single pups at age 3. In unutilized populations, the females mature at age 3–6 years, but the males do not reach harem status until 12 years old. Most harems contain 20 to 40 females, but up to 100 have been counted. The pups are born in October, about 1 week after the females haul out, are 1.2 m long, weigh 36 kg, and nurse about 23 days. The females mate about 18 days after their pups are born. The females live about 12 years and the males up to 20. The leopard seal and killer

whale are natural enemies of the southern elephant seal.

Ecological problems. None known.

Allocation problems. According to Laws (in press) the southern elephant seal may become threatened because they compete with Soviet fishermen for commercial species of fish.

Current research. The University of Minnesota makes incidental observations of this mammal while studying the Antarctic seal species.

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NORTHERN ELEPHANT

(*Mirounga angustirostris*)

Distribution and migration. This species originally occupied rookeries and hauling grounds on the mainland and islands from Cabo San Lazaro, Baja California, northward to Pt. Reyes, just north of San Francisco. Nonbreeding animals range at least as far north as southeastern Alaska.

Abundance and trends. By 1890 the population had been reduced to 100 or fewer animals found only on Guadalupe Island, but this number increased to an estimated 15,000 animals by 1960 (Bartholomew and Hubbs, 1960). Peterson and LeBoeuf (1969) estimated a population of about 30,000 in 1969. This species has reoccupied most or all of its historic rookeries and hauling grounds. The first birth of a pup on the Farallon Islands (northern limit of the historic breeding range) was observed on 21 January 1972 by David Ainsley, a biologist from the Pt. Reyes Bird Observatory (San Francisco Chronicle, 25 January 1972).

The California Department of Fish and Game has counted elephant seals during sea lion census in early June since 1965 (Carlisle and Aplin, 1971). Carlise (1973) has counted *Mirounga* on San Miguel Island each year from 1965 through 1973 except 1968. Recent California counts do not indicate any trend in abundance.

Odell (1972) believes that the San Nicolas Island population is increasing. The largest California population of *Mirounga* is found on San Miguel Island, where 3,137 were counted 26 February 1972 by Johnson and DeLong (pers. comm.). Carlisle (1973) counted 3,600 in 1973.

General biology. The adult males usually arrive first on the rookeries in November, followed by the pregnant females in December. Dominant adult males occupy choice locations within the breeding colonies and do most of the mating. The female usually bears a single pup about 7 days after her arrival and weans it about a month later. The female is bred during her last few days ashore. Maximum lengths are about 5 m for adult males and 3.3 m for adult females. Newborn pups are about 1.2 m in length. Little information on the feeding habits of *Mirounga* are available. The stomach of one elephant seal contained seven ratfish, one 66.0 cm California dogfish shark, one swell or puffer shark, three skates, and four squids. The species apparently can feed at considerable depths, as indicated by prey species and the fact that three young *Mirounga* were taken on hooks set in about 100 fathoms.

Ecological problems. Oil from the Santa Barbara spill of 28 January 1969 coated about 100 elephant seal pups ashore on one area of San Miguel Island. The pups had been weaned and apparently suffered no ill effects.

Allocation problems. None known.

Current research. Scientists from the University of California at Santa Cruz, Calif., are studying this species.

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BLACK RIGHT WHALE

(*Balaena glacialis*)

Distribution and migration. This right whale inhabits all temperate waters of the world. It migrates between summering grounds in cool temperate waters and wintering grounds in warm temperate waters; the wintering grounds are mostly along continental coasts or around islands.

Three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere.

In the eastern North Pacific Ocean, the right whale ranges from Bristol Bay and the Gulf of Alaska south to 50° N latitude during the summer, and from Oregon south to central Baja California during the winter.

In the western North Atlantic Ocean, it ranges from Labrador south to the Bay of Fundy during the summer, and Massachusetts south to Florida and Bermuda during the winter.

Abundance and trends. The right whale was originally very abundant, but heavy exploitation, mostly during the 19th century, reduced all populations nearly to extinction by the turn of the century. At least some local stocks have increased in recent years. Present numbers are: North Pacific Ocean—about 250 (Wada, 1972); North Atlantic Ocean—no estimate; Southern Hemisphere—about 4,300 (Masaki, 1972).

General biology. The black right whale is a heavy-bodied animal up to 18.0 m long and is characterized by lack of a dorsal fin and by a large head with a narrow arched rostrum. It feeds mainly on copepods. The reproductive biology is poorly known. Body length at sexual maturity is about 15.2 m in males and 15.8

m in females. Mating and calving occur in the winter, so the gestation period is probably about 1 year. The female probably bears a calf only once every 2 (or more) years.

Ecological problems. None known.

Allocation problems. None known.

Current research. Research on the black right whale is being carried out by the South African Division of Sea Fisheries and off Argentina by a joint project of the National Geographic Society and the New York Zoological Society.

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BOWHEAD WHALE

(*Balaena mysticetus*)

Distribution and migration. The bowhead whale inhabits arctic and subarctic waters in four principal areas: (1) From Spitzbergen west to east Greenland; (2) in Davis Strait, Baffin Bay, James Bay, and adjacent waters; (3) in the Bering, Chukchi, Beaufort, and East Siberian Seas; and (4) in the Okhotsk Sea. They migrate with ice movements.

Abundance and trends. All bowhead whale populations were decimated by the end of the 19th century because of the great value of this species for oil and baleen (Tomilin, 1957). No commercial whaling for bowheads has taken place since about 1915. Eskimos in several arctic coastal villages of Alaska continue to hunt these whales which are an important part in the subsistence economy of the villages. In the last two decades the take of bowhead whales by Eskimos in Alaska has varied between 1 (1959) and 37 (1972) (Maher and Wilimovsky, 1963; Durham, unpublished records). Much of this variation in take is because of variation in hunting conditions, although in recent years an increase in hunting intensity may have taken place. Bowhead whales are taken only occasionally by U.S.S.R. nationals (Zemsky, 1973, pers. comm.). The bowhead whale population of Canada and the Bering, Chukchi, and East Siberian Seas appears to be increasing (Mansfield, 1971; Burns, pers. comm.).

General biology. The bowhead whale grows to 18 m in length. Sexual maturity is reached at 11.6 m and 12.2 m in males and females, respectively. Mating probably occurs in early April or earlier. Gestation lasts 12-13 months, with a single calf (3-4.5 m long) born in April–May. The calf is weaned at 6 months. The reproductive cycle is apparently 2 years. These whales travel singly, in pairs, or threes during the spring. In autumn they are generally scattered, but may occur in groups of up to 50. They feed mainly on euphausids and other krill, but occasionally on bottom-dwelling invertebrates.

Ecological problem. The north-slope oil project might alter the inshore southward migration should fall steamer and barge traffic increase to force the whales farther offshore.

Allocation problems. Some conflict of interest may exist between people who would like complete protection for bowhead whales and Eskimos who hunt these whales. An undetermined number of bowhead whales struck are lost due to the method of eskimo hunting.

Current research. The University of Southern California has been under contract to the National Marine Fisheries Service (Seattle) to gather biological data on bowhead whales in 1973. In the spring of 1973 a group of scientists from U.S. and Canadian universities attempted to record underwater sounds of the bowhead whale. The Fisheries Research Board of Canada makes annual surveys from planes of bowhead whales in Canadian waters.

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GRAY WHALE

(*Eschrichtius robustus*)

Distribution and migration. The gray whale is now restricted to the North Pacific Ocean, although it once occurred in the North Atlantic Ocean.

Two geographically isolated populations are recognized: (1) The eastern Pacific ("California") stock, which spends the summer in the Chukchi, western Beaufort, and northern Bering Seas (and rarely along the coast as far south as central California), and migrates to the west coast of Baja California and the southern Gulf of California for the winter; and (2) the western Pacific Ocean ("Korean") stock, which spends the summer in the northern Sea of Okhotsk and migrates to the sountern coast of Korea for the winter.

Abundance and trends. Eastern North Pacific Ocean—contrary to earlier published estimates, the original population was almost certainly less than 15,000 (Henderson, 1972). During the late 18th and early 19th centuries the population was greatly reduced. Since complete protection was given the stock in 1947, the population has increased to about 11,000 and has remained stable since 1967 (Rice and Wolman, 1971). In 1972, 181 gray whales were killed in subsistence fishery on the Chukotski Peninsula in Siberia (Zemsky, 1973, pers. comm.), and in some years one to three gray whales are taken by Eskimos in Alaska.

Western North Pacific Ocean—in 1910, the population probably numbered between 1,000 and 1,500. It now appears to be extinct.

General biology. The gray whale is identified by its mottled gray color and low hump in place of a dorsal fin. It feeds on benthic amphipods and other benthic invertebrates on the summering grounds, and fasts during migrations and on wintering grounds. Sexual maturity is attained at age of 5 to 11 years, at a mean body length of 11.0 m for males and 11.6 m for females. The mating season is in late November and early December while the animals are on their southward migration. The calf is born following a 13-month gestation period after the pregnant females have arrived in certain shallow lagoons on the west coast of Baja California. The female bears a calf only once every 2 or more years. The calves average about 5.0 m long at birth and are weaned 7 months later when they about 8.0 m long.

Ecological problems. The gray whale is now valuable as a tourist attraction, and it supports a rapidly increasing cruise-boat industry, including ½-day cruises off San Diego and Los Angeles, and week-long cruises from these ports to Scammon's Lagoon. These activities have generated a problem of increasing harassment of the whales. In 1972, the Mexican Government declared Scammon's Lagoon a whale refuge, so the activities of the cruise boats are now partly regulated.

Current research. Studies on gray whales are being conducted by the National Marine Fisheries Service and the Soviet Union's Far Eastern Institute of Marine Fisheries and Oceanography.

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Minke Whale

(*Balaenoptera acutorostrata*)

Distribution and migration. The minke whale inhabits all oceans of the world, except in equatorial regions, and ranges into the polar pack ice zones in the Northern and Southern Hemispheres. It makes extensive seasonal migrations between high-latitude summering grounds and low-latitude wintering grounds.

At least three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. The affinities of the minke whale stocks in the northern Indian Ocean are unknown.

In the eastern North Pacific Ocean, the minke whale ranges from the Chukchi Sea south to northern Baja California during the summer, and from central California south to the Islas Revillagigedo off central Mexico during the winter.

In the western North Atlantic Ocean, it ranges from Baffin Bay south to Chesapeake Bay during the summer, and from the eastern Gulf of Mexico and northeastern Florida to the Bahamas during the winter.

Abundance and trends. The minke whale has long been an important species in the "small whale" fisheries of the world. In 1972, catches were: Norway—2,650; Iceland—35; Greenland—145; Newfoundland—97; Japan—341; Brazil—702; Korea—no data; South Africa—135. During the 1972–73 season, 5,743 minke whales were taken in the Antarctic. In the 1972–73 season, Japan sent two factory ships to the Antarctic specifically for minke whales. No estimates are available of the abundance of this species in the North Pacific or North Atlantic. In the Southern Hemisphere the present population, which is virtually unexploited, numbers at least 200,000 (International Whaling Commission, 1973).

General biology. The minke whale is the smallest member of the genus *Balaenoptera*, not exceeding 10 m in length in the Northern Hemisphere. The northern animals are distinguished by a white band on the flipper; individuals from the Southern Hemisphere average about a meter longer, and usually lack the white length of 7.0 m in males and 7.9 m in flipper band. The minke whale feeds some small fishes. In the Northern Hemmainly on euphausiids, but also takes isphere, it attains sexual maturity at an age of 7 to 8 years and an average body females. The female bears a calf only once every 2 years (rather than annually, as once believed). During the summer, pregnant females migrate to much higher latitudes than do the lactating and immature females.

Ecological problems. None known.

Allocation problems. None known.

Current research. Research on minke whales is being conducted by the Japanese Far Seas Fisheries Research Laboratory, the South African Division of Sea Fisheries, and the Norwegian State Institute for Whale Research.

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Bryde's Whale

(*Balaenoptera edeni*)

Distribution and migration. The Bryde's whale is found in tropical and warm temperate coastal waters around the world. In the western Atlantic Ocean, it ranges from the Gulf of Mexico south to Cabo Frio, Brazil, and in the eastern Atlantic Ocean from Morocco south to the Cape of Good Hope. In the Indian Ocean, it ranges from the Cape of Good Hope north to the Persian Gulf, east to the Gulf of Martaban, Burma, and thence south to Shark Bay, Western Australia. In the western Pacific Ocean, it is distributed from northern Hokkaido, Japan, south to Victoria, Australia, and North Island, New Zealand; in the eastern Pacific Ocean, it ranges from central Baja California, Mexico, south to Iquique, Chile.

At least some of the temperate zone populations (Japan, South Africa) make limited seasonal migrations. The tropical populations may be sedentary.

Abundance and trends. The Bryde's whale is of minor importance in the modern whaling industry. Until recently, only a few of these animals were taken by shore stations in Japan, South Africa, and rarely elsewhere. Since 1970, however, increasing numbers have been harvested by Soviet and Japanese pelagic expeditions in the western North Pacific Ocean, as these expeditions have shifted operations more to the south. The population in the western North Pacific Ocean (the only one that has been exploited significantly) numbers between 5,000 and 18,000, and is probably above the level needed for a maximum sustainable yield (Ohsumi, Shimadzu, and Doi, 1971). Estimates of populations elsewhere in the world have not been made.

General biology. The Bryde's whale is very similar in appearance to the sei whale, and the two species were formerly confused. The Bryde's whale is slightly smaller—usually less than 13.5 m long; its throat grooves extend posteriorly beyond the umbilicus, and it has a pair of lateral ridges on top of its snout, one on each side of the median ridge. The fringe on its baleen plates is much coarser than that of the sei whale. If feeds mainly on small schooling fishes, and also takes some euphausiids and other crustaceans. Males attain sexual maturity at an average length of 12.2 m and females at 12.5 m. The mating and calving season is usually during the winter, but in some areas—South Africa, for example—they breed year-round. The gestation period is about 1 year. The female does not bear a calf 2 years in succession.

Ecological problems. None known.

Allocation problems. None known.

Current research. Research on the Bryde's whale is being conducted by the South African Division of Sea Fisheries and the Japanese Far Seas Fisheries Research Laboratory.

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Sei Whale

(*Balaenoptera borealis*)

Distribution and migration. The sei whale is nearly world wide in distribution. In the eastern North Pacific, it summers from California to the Gulf of Alaska and Aleutian Islands; in the North Atlantic, from New England and the British Isles to the Arctic Ocean. In winters at low latitudes. In the Southern Hemisphere this species summers in all oceans from 30° S latitude and southward, and in winter it is generally found north of 40° S latitude.

Abundance and trends. Information in this section is from the annual reports of the International Whaling Commission (1972, in press) and from recent reports of the Bureau of International Whaling Statistics. Stock sizes available for commercial harvest are estimated to be about 80,000 in the southern oceans and 33,000 to 37,000 in the North Pacific Ocean. Definitive stock estimates of this species in the North Atlantic are not available, though a tentative estimate for the population off Nova Scotia is 1,570. In addition, all stocks contain unknown numbers of sei whales younger than those utilized commercially because a minimum length restriction prevents the taking of these animals and development of population data on this segment of the herd. The sei whale is the second most valuable baleen whale, and populations appear to be near the level of maximum sustainable yield. Catches of sei whales in recent seasons have been:

Season	North Pacific	North Atlantic	Southern oceans (south of 40° S.) [1]	Southern land stations
1969	5,158	222	5,857	[2] 824
1970	4,504	551	6,153	138
1971	2,993	475	5,452	446
1972	2,827	315	3,864	9

[1] Southern oceans catches are for the seasons 1969–70, 1970–71, 1971–72, 1972–73, respectively.
[2] No information from Brazil and Chile in 1969.

General biology. The species resembles the fin whale but is slightly smaller, with less white underneath, and a large dorsal fin. In the far north of the northern hemisphere it feeds mostly on copepods. The diet is much more varied in lower latitudes—including euphausiids, copepods, sauries, anchovies, herring, sardines, and jack mackerel. Sei whales usually travel in small pods of 2–5. They attain sexual maturity at 6–12 years of age, at a body length of about 13.1 m (males) and 13.7 m (females). Females bear calves every 2 or 3 years. The mating and calving season occurs in winter in the respective hemispheres. Gestation lasts 1 year, and the calf is weaned when about 7 months old.

Seven percent of the sei whales taken off California have been infected with a unique disease that causes progressive shedding of the baleen plates and their replacement by an abnormal papilloma-like growth.

Ecological problems. None known.

Allocation problems. None known.

Current research. The National Marine Fisheries Service will share in population and biological studies of this species. Other organizations carrying out research on this species are the Japanese Whale Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), Norwegian State Institute for Whale Research (Antarctic), British National Institute of Oceanography (South Africa and Antarctic), South African Division of Sea Fisheries (South Africa), and Soviet All-Union Research Institute of Marine Fisheries and Oceanography.

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Fin Whale

(*Balaenoptera physalus*)

Distribution and migration. The fin whale is nearly world wide in distribution. In the eastern North Pacific it summers from California into the Chukchi Sea, and in the North Atlantic from Cape Cod and Spain into the Arctic Ocean. The fin whale migrates to more southern latitudes in winter. In the Southern Hemisphere it is generally found at latitude 40°–60° south in summer and from 20°–40° south in winter.

Abundance and trends. Information in this section is from the annual reports of the International Whaling Commission (1972, in press) and from the reports of the Bureau of International Whaling Statistics, Sandefjord. Stock sizes available for commercial harvest are estimated at about 80,000 in the Southern Hemisphere, 10,000 to 13,000 in the North Pacific, and about 7,000 in the Northwest Atlantic and possibly in the Northeast Atlantic. In addition, all stocks contain unknown numbers of whales younger than those utilized commercially because a minimum length restriction on the catch prevents the taking of these animals and development of population data on this segment of the herd. Recent catches from the stocks have been:

Season	North Pacific	North Atlantic	Southern oceans [1]	Southern land stations [2]
1969	1,276	800	3,002	224
1970	1,012	911	2,890	122
1971	802	668	2,663	40
1972	758	598	1,761	51

[1] Southern ocean catches are for the seasons 1969–70, 1970–71, 1971–72, 1972–73, respectively.
[2] No information from Brazil and Chile.

The fin whale is commercially the most valuable baleen whale. Stocks in the North Pacific and southern oceans are below maximum sustainable yield levels.

General biology. This species is second in size only to the blue whale; in the Northern Hemisphere it grows to at least 23.2 m and is distinguished by a gray back, white beely, and well-developed dorsal fin. Fin whales feed mostly on euphausiids, but often eat fish—especially anchovies in the North Pacific and capelin in the North Atlantic. They usually travel in small pods of 2–5 animals. Fin whales are sexually mature at 6–12 years, and at a body length of about 17.7 m (males) and 18.3 m (females). Females bear calves every 2–3 years. The mating and calving season occurs in winter in respective hemispheres. Gestation lasts 1 year and the calf is weaned at about age 7 months.

Ecological problems. None known.

Allocation problems. None known.

Current research. The National Marine Fisheries Service plans to share in population and biological studies of this species. Other organizations carrying out research on this species are the Japanese Whales Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), British National Institute of Oceanography (South Africa and Antarctic), South African Division of Sea Fisheries (South Africa), and Soviet All-Union Research Institute of Marine Fisheries and Oceanography (North Pacific and Antarctic).

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Blue Whale

(*Balaenoptera musculus*)

Distribution and migration. The blue whale is found throughout all oceans from the equator to the polar pack ice zones in the Northern and Southern Hemispheres. It makes seasonal migrations between rather restricted high-latitude summering grounds and low-latitude wintering grounds.

At least three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. Each population is probably comprised of several more or less discrete stocks. The "pygmy blue whale" of the southern Indian Ocean is morphologically distinct from the stocks which spend the summer in Antarctic waters. The affinities of the blue whale populations in the Arabian Sea and Bay of Bengal are unknown.

In the eastern North Pacific Ocean, blue whales range from the Aleutian Islands and Gulf of Alaska south to central California during the summer, and from central Baja California south to southern Sinaloa, Mexico, during the winter.

In the western North Atlantic Ocean, they range from Davis Strait south to the Gulf of St. Lawrence during the summer (the winter range of this stock remains unknown).

Abundance and trends. During the first half of the 20th century, the blue whale was one of the most important cetaceans to the whaling industry, but it is now so rare that it will require probably half a century of complete protection to restore the stocks to a significant level. In the North Pacific Ocean the population, which once numbered about 5,000, now contains about 1,500 individuals (Ohsumi and Wada, 1972). This species apparently has been slowly increasing since 1966, the year it was first given complete protection.

The population in the western North Atlantic (off eastern Canada), which originally numbered about 1,100, is now much less (Allen, 1970). Estimates of the eastern North Atlantic population have not been made.

The Southern Hemisphere population originally numbered about 200,000 (Chapman, Allen, and Holt, 1964), but was severely depleted before complete protection was given the stock in 1965. Gulland (1972) states that the most likely recent history of blue whale numbers would be a catchable stock of some 4,000 whales in 1963, which has increased to some 6,000 (at about 4 to 5 percent per year) plus a similar number of blue pygmy whales.

General biology. The blue whale is the largest mammal that ever lived on earth, reaching a known length of 29 m and a weight of 136 tons. It is distinguished from the fin whale by its mottled blue-gray color dorsally and ventrally, its smaller dorsal fin, its broad flat snout, and its black baleen plates. Blue whales feed exclusively on euphausiids during the summer, and fast during the winter. They become sexually mature at an average age of about 10 years, when males of the Antarctic stocks average 22.5 m and females 24.0 m; blue whales of the Northern Hemisphere average about 1 m shorter, whereas the "pygmy" blue whales of the southern Indian Ocean average about 2 m less in length. Every 2 or 3 years during the winter months the female gives birth to a calf after a 12-month gestation period. At birth the calf is about 7 m long; when weaned 8 months later it is about 15 m long.

Ecological problems. None known.

Allocation problems. None known.

Current research. Observers aboard whaling and research vessels record sightings of blue whales and routinely report them to the International Whaling Commission.

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HUMPBACK WHALE

(*Megaptera novaeangliae*)

Distribution and migration. The humpback whale is found in almost all oceans from tropical waters to the edge of, but not into, the polar pack ice zones in the Northern and Southern Hemispheres. It makes extensive seasonal migrations between higher latitude summering grounds and low-latitude wintering grounds—the latter along continental coasts or around islands.

Three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. Each population is comprised of several almost entirely discrete stocks.

In the eastern North Pacific Ocean, the humpback whale ranges from the Chukchi Sea south to southern California during the summer, and from southern California south to the Islas Revillagigedo and Jalisco, Mexico, and also around the Hawaiian Islands, during the winter.

In the western North Atlantic Ocean it ranges from Disco Bay in western Greenland south to Massachusetts during the summer, and from Hispaniola and Puerto Rico south to Trinidad during the winter.

Abundance and trends. The humpback whale was important, especially to shore stations, during the first half of the 20th century. Now, however, this mammal is so scarce that it will require a half century of complete protection for it to increase to a significant level. A few are killed in subsistence fisheries in Greenland, the Lesser Antilles, and the Tonga Islands. It has a minor value as a tourist attraction in Hawaii and southeastern Alaska. The original population size of the North Pacific Ocean is unknown, but is now severely depleted to about 1,200 individuals (Wada, 1972). The animals have apparently not increased since complete protection was given the species in 1966.

The original population size of the North Atlantic Ocean is unknown, and the western North Atlantic Ocean stock is now reduced to less than 1,000 animals (Allen, 1970). A small increase may have occurred in recent years. Estimates of the eastern North Atlantic Ocean population have not been made.

The original population of the Southern Hemisphere, which probably numbered about 100,000, now contains about 3,000 individuals (Chapman, in press; Masaki, 1972). The stock has apparently not increased since complete protection was given the species in 1964.

General biology. The humpback whale is much more heavily bodied than members of the genus *Balaenoptera*, and is characterized by its extremely long flippers. It feeds mainly on euphausiids, but also eats anchovies and sardines when available. The species attains sexual maturity at an age of 6 to 12 years, when males average 11.6 m long and females 11.9 m. The mating and calving season is from October to March in the Northern Hemisphere, and April to September in the Southern Hemisphere. The gestation period is 12 to 13 months and the calf nurses for about 11 months. The female rarely bears a calf 2 years in succession.

The humpback whale is heavily infested with three species of ectocommensal barnacles and with whale lice.

Ecological problems. None known.

Allocation problems. None at present.

Current research. Observers aboard research vessels and foreign whaling ships record sightings of humpback whales and routinely report them to the International Whaling Commission.

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ROUGH-TOOTHED DOLPHIN

(*steno bredanensis*)

Distribution and migration. The rough-toothed dophin inhabits tropical and warm temperate seas. It ranges in the western Atlantic Ocean from Virginia south. In the North Pacific Ocean it ranges north to southern Japan (35° N) where it is rare, and to the Hawaiian Islands where it is fairly common. It is unknown from the eastern North Pacific except for one stranding near San Francisco.

Abundance and trends. The rough-toothed dolphin is uncommon but not rare throughout most of its range. It is

seldom caught in the Japanese dolphin fishery (Ohsumi, 1972), and has been recorded on a few occasions in the eastern tropical Pacific tuna fishery (NOAA, 1972).

General biology. This dolphin grows to about 2.4 m. Little is known of its biology or habits. Circular scars on its skin suggest that this species feeds on large squid.

Ecological problems. None known.

Allocation problems. None known.

Current research. The Oceanic Institute of Hawaii is studying this species in the wild.

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BOTTLENOSED DOLPHIN

(*Tursiops truncatus*)

Distribution and migration. The bottlenosed dolphin is widely distributed in temperate and tropical waters, but strays into much colder latitudes. In the western Atlantic Ocean, it ranges from southern Greenland and Canada to Patagonia, but is best known from New England southward through the West Indies and Caribbean. In the eastern Atlantic, it is found from the northeast Scandinavian coast to South Africa. In the eastern Pacific Ocean, its northern limit is probably Oregon, and it ranges south to Chile. In the western Pacific, it is found north to Japan and south to Australia and New Zealand. Its Pacific range includes the Hawaiian Islands, where it is said to be common. Nominal species have been named from the tropical Indo-Pacific (*T. aduncus*), and the northern Gulf of California and waters along the west coast of Baja California and southern California (*T. gilli*). The geographical ranges and characters delimiting these named forms are still poorly defined. The Small Cetaceans Subcommittee of the International Whaling Commission, commenting on the taxonomy of *Tursiops*, indicated that while "the necessary taxonomic work has not yet been done, it seems likely that there is only one species of *Tursiops*, with sharply-defined geographical races varying in body size and tooth size and distributed differentially relative to sea temperature and depth. There is great need to gather materials that will allow definitive examination of the nominal species *T. aduncus*, *T. gilli* and *T. nunanu*, and materials from as many other populations as possible. These names are currently used by some workers." Limited and subjective data suggest that populations are localized within about a 100-mile radius and that this species does not make long migrations.

Abundance and trends. In North Carolina, from 500 to 1,500 animals were killed annually by the early 20th century (Townsend, 1914). A few bottlenosed dolphins are now taken for food in small open-boat pilot whale fisheries in the Lesser Antilles (St. Vincent, St. Lucia, Dominica) and some are harvested by Venezuelan fishermen. Several hundred bottlenosed dolphins are taken each year off Florida, Mississippi, and Texas for display in marine aquariums and for research. Some of these animals are shipped alive to Hawaii, California, and Europe. Trends are based on subjective data, but it is believed that local populations of the southeastern United States are not now being reduced by these activities (D. K. Caldwell, pers. comm.).

General biology. Bottlenosed dolphins are 1.1 m long at birth and grow to 3.6 m in length and 650 kg in weight. Captive animals have become sexually mature at 6 years, but recent evidence suggests that this species normally breeds at about 12 years. Gestation lasts about one year, and calves may nurse for 1.5 to 2 years, although they begin to take solid food at age 6 months. Breeding apparently occurs throughout the year, but the fact that most of the young are born during a certain time of year suggests that breeding, as well as calving, takes place in the spring and summer. This dolphin is likely to be seen in bays and lagoons, sometimes venturing far up large rivers. These dolphins are usually found close to shore and near islands, but some populations live well beyond the continental shelf. Bottlenosed dolphins are often seen in large loose schools of several hundred animals, which appear to consist of aggregations of small groups of no more than a dozen individuals. Humpback and right whales traveling along the Atlantic coast of Florida are almost always accompanied by bottlenosed dolphins. Bottlenosed dolphins feed on several species of fish, squid, and a few crustaceans. Bottlenosed dolphins have been trained to dive to a depth of about 305 m, from where they have returned within a few minutes. The estimated life span for this species is about 30 years, but it may be longer. Bottlenosed dolphins are extremely social and quick to learn a show routine or experimental procedure. They have been credited with a high order of intelligence, which has not been demonstrated experimentally.

Ecological problems. None known.

Allocation problems. Bottlenosed dolphins have been accused of harassing fishing efforts by biting fish and shrimp nets and some fishermen attempt to drive them away. Some fishermen consider this dolphin a threat to their activities. Bottlenosed dolphins are occasionally trapped accidentally in commercial fishing gear. In this way, a small number are lost in the eastern Pacific tuna seine fishery. The effect on the population of taking these animals off the southeast United States for display and research is not understood and could become a problem.

Current research. Several agencies and institutions conduct or support research on the bottlenosed dolphin. Included are the Office of Naval Research, National Institutes of Health, and the National Science Foundation. The University of Florida concentrates its research on general life history, intraspecies communication, and ecological studies. The Florida State Museum is studying systematics. Research in physiology, echolocation, anatomy, life history and the behavior of captive and wild individuals has been done at the Naval Undersea Centers in San Diego and Hawaii. Studies on vision are being carried out by scientists from the University of Miami. The Dolfinarium at Harderwijk, Netherlands, has recently conducted studies of the physiology and handling of these animals.

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RISSO'S DOLPHIN, GRAMPUS

(*Grampus griseus*)

Distribution and migration. The Risso's dolphin ranges through all temperate and tropical seas. In western North America its northern limit is British Columbia, and it is sighted during the winter in central California. In the eastern United States it ranges from Massachusetts south. Strandings in Britain are most common during the summer. The species probably migrates to higher latitudes in warmer months.

Abundance and trends. Risso's dolphin was described in 1894 as "abundant" near Monterey Bay, California (Daugherty, A. E., 1972). The species is uncommon but not rare throughout most of its range. Over 200 of these animals were sighted in one group during 1972 off the Washington coast (Fiscus, Unpublished field notes, 1972).

General biology. Risso's dolphin grows to 3.6–4.0 m. Its skin commonly has long, narrow, white marks believed to be scars caused by others of the same species. Solitary animals or schools of 12 or less are generally observed. This species is frolicsome, and sometimes leaps clear of the water. Known foods are almost exclusively cephalopods.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

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WHITE-BEAKED DOLPHIN

(*Lagenorhynchus albirostris*)

Distribution and migration. The white-beaked dolphin inhabits the coastal waters of the North Atlantic Ocean from the Barents Sea and Davis Strait to France and Massachusetts. It is most common in the North Sea from the east coast of the United Kingdom to the Faroe Islands, and may winter in the southerly parts of the North Atlantic Ocean. It appears in Davis Strait in the spring and summer after the beluga and narwhal migrate north and leaves in autumn sometimes as late as November. It apparently ranges farther north into Arctic waters than its relative the white-sided dolphin.

Abundance and trends. This species is one of the more abundant of North Atlantic toothed whales. Schools of as many as 1,500 have been reported from the coast of Norway where it is attracted by herring (Fraser 1949).

Tomilin (1957) reports schools of several hundred and states that this species is taken commercially in Norway, but gives no statistics on the catch. He also mentions that it was once taken commercially in Davis Strait.

General biology. This gregarious species grows to 3.0 m; the calves are as long as 1.2 m when born. The mating period is long, but limited to the warmer half of the year. Most of the calves are born during midsummer. Food is mainly fish such as herring, cod, whiting, and capelin, but also crustaceans and mollusks such as hermit crabs, whelks, and squids.

Ecological problems. Strandings of schools of up to 30 animals have been reported.

Allocation problems. None known.

Current research. None.

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ATLANTIC WHITE-SIDED DOLPHIN

(*Lagenorhynchus acutus*)

Distribution and migration. The Atlantic white-sided dolphin ranges the coastal waters of the North Atlantic Ocean from the Barents Sea and Davis Strait south to France and Cape Cod.

Abundance and trends. The status of this species is unknown. According to Tomilin (1957), "this dolphin is taken only in summer in the waters of Norway: the animals are trapped in the fjords, which they enter in vast schools pursuing herring. The take may reach 1,500 individuals at a time."

General biology. This species grows to 3.0 m. The young are born mostly in midsummer and are about 1.0 m in length. It feeds mostly on pelagic and benthopelagic fish such as mackerel, salmonids, and herring, and some crustaceans and molluscs such as *Pagurus* and *Buccinum*. Schools in excess of 1,000 animals have been reported while they were feeding; groups of 10 to 50 are normally seen.

Ecological problems. Stranded schools of up to 30 have been reported.

Allocation problems. None known.

Current research. None.

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PACIFIC WHITE-SIDED DOLPHIN

(*Lagenorhynchus obliquidens*)

Distribution and migration. The Pacific white-sided dolphin ranges the northern North Pacific from the coast of Japan and Baja California northward. It is found year round off California and Washington and in Alaska and Kurile Island waters during the summer, but has not been reported from the Bering Sea. It frequents the waters of the continental shelf and slope but on occasion has been sighted in large schools in offshore waters.

Abundance and trends. Norris and Prescott (1961) report the species as common off southern California in inshore waters in winter and spring and offshore in summer and fall. According to sighting reports in the National Marine Fisheries Service files, Seattle, and by Pike and MacAskie (1969), this species may be the most abundant dolphin north of southern California. No estimate of the size of the population along the west coast of North America has been made.

Nishiwaki (1972) estimates the population in Japanese waters to be between 30 and 50 thousand. Klumov (1959) reports that the Pacific white-sided dolphin is one of the two most numerous dolphins found in the late summer and fall in the Kurile Islands area, and forms schools of up to several thousand animals.

A few of these animals are taken for display in ocean aquaria.

General biology. This species grows to 2.3 m, and weighs up to 181 kg. A male 1.2 m in length with milk in its stomach was taken off Washington. It probably breeds in late spring to autumn, with a gestation period of 10–12 months. Schools of thousands are seen, often together with common and right-whale dolphins. It is active day and night, frolics, follows ships, dashes across ships' bows, and occasionally jumps clear of the surface. It adapts well to captivity. This dolphin feeds primarily on cephalopods and small fish such as herring, sardine, anchovy, and saury.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

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SARAWAK DOLPHIN

(*Lagenodelphis hosei*)

Distribution and migration. Only a single specimen of the Sarawak dolphin, from Borneo, was known to science until 25 of the mammals were taken in a tuna purse seine in the eastern tropical Pacific. Since then, it has been recorded from several widely separated localities in the Pacific and Indian Oceans: Durban, South Africa; near Sydney, Australia; Tokyo, Japan; and the Central Pacific south of Hawaii.

Abundance and trends. The animal is rare in collections and presumably not common in its habitat (Perrin et al., 1973).

General biology. Length at birth is approximately 1 m, and the adults are

about 2.5 m long. This dolphin feeds on deep living fishes and squids.

Ecological problems. None known.

Allocation problems. Loss of Sarawak dolphins in the tuna fishery is minor in terms of absolute numbers, but may be significant considering the apparent extreme rarity of the animal. Twenty-nine of thirty-four identified specimens have been taken in tuna seines.

Current research. None.

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SPOTTED DOLPHIN

(*Stennella attenuata*)

(*S. frontalis*)

(*S. graffmani*)

(*S. dubia*)

Distribution and migration. Knowledge of the spotted dolphins is scanty, and their taxonomy is confused, but two species probably exist. The taxonomy used here is provisional. One form is confined to warm waters of the Atlantic and probably is *Stenella plagiodon* Cope. This species, the Atlantic spotted dolphin, is discussed in a separate status report. The other apparent species occurs in all tropical waters of the world, including the Atlantic Ocean, and has been identified as belonging to the four above-listed nominal species. Taxonomists do not agree on the taxonomy. The two apparent species are different in basic color pattern but both have spots.

The spotted dolphin occurs in the Gulf Stream adjacent to the U.S. east coast and in the Gulf of Mexico. Nothing is known of its migrations. It has not been recorded from the U.S. Pacific Coast, but it is the primary cetacean species involved in the tuna fishery in the eastern tropical Pacific, from Cabo San Lucas to Peru and west to approximately long. 145° W. It occurs around the Hawaiian Islands and in the U.S. Trust Territory. The maximum recorded movement of a single animal is 1,300 miles (2,080 km) in 236 days.

Abundance and trends. Population estimates and trends in abundance are not available for these species.

General biology. Length at birth of the race involved in the tuna fishery is about 0.8 m. Adults of the various races are 1.6–2.6 m long. Considerable geographic variations exist in external size and shape, coloration, and skeletal structure, with pronounced differences between coastal and offshore subspecies in the eastern Pacific. It feeds on small mesopelagic and epipelagic fishes and squids. In the eastern tropical Pacific, this species commonly associates with the spinner porpoise in mixed aggregations of up to several thousand animals.

Ecological problems. None known.

Allocation problems. Because of their association with yellowfin tuna, many of these mammals are taken incidentally during tuna harvesting operations by fishermen from Canada, France, Japan, Mexico, Panama, United States, and other countries in coastal and international waters in the eastern tropical Pacific (ETP).

Current research. The National Marine Fisheries Service and the tuna industry are assessing the effects of fishing mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. Other research includes systematic and ecological studies by P. J. H. van Bree at the Zoological Museum in Amsterdam, W. Dawbin at Sydney University, and E. D. Mitchell at the Arctic Biological Station of the Fisheries Research Board of Canada in Ste. Anne de Bellevue, Quebec.

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ATLANTIC SPOTTED DOLPHIN

(*Stenella plagiodon*)

Distribution and migration. The Atlantic spotted dolphin (exact taxonomic position not yet known) is probably confined to tropical and subtropical waters of the Atlantic Ocean. It occurs on the U.S. Gulf coast and off the east coast in Gulf Stream waters, and may be restricted to continental waters, being replaced in the West Indies by some other species in this genus (probably *Stenella frontalis*). Seasonal inshore-offshore migrations occur in Florida waters, and perhaps elsewhere in the Gulf of Mexico, with animals moving close to shore in late spring.

Abundance and trends. Population estimates have not been made for this species. The only known fishery for the species has taken 12 or fewer animals per year for display, however, these animals do not easily withstand handling and captivity. Thus, an increased fishery for display animals is not likely.

General biology. The newborn are about 0.8 m long, and the adults reach 2.0–2.2 m in length. Little is known of the life history of this species. Except for the annual spring migrations to near shore, this species is considered a mammal of the outer continental shelf or adjacent high seas. Spotted dolphins appear to feed primarily on squid in the wild, but they readily adapt to a fish diet in captivity. Newborn and young animals are not spotted, but progress through a series of color changes until the adults become spotted all over except for the ventral surface near the belly. This species is subject to infestations externally by barnacles and whale lice, internally by trematodes in the stomach, liver, and pancreas, and nematodes in the lungs and stomach. In captivity and in cold weather, these animals easily contract pneumonia.

Ecological problems. Little is known about the ecology of this dolphin, but because it normally lives well offshore, it seems likely that it is affected little by man.

Allocation problems. None known.

Current research. Some information on this species has been gathered incidental to studies by the Office of Naval Research on the bottlenosed dolphin. Most of the recent research has been on various aspects of sound production by this species. However, David K. and Melba C. Caldwell have long been gathering general biological information at the Marine Mammal Center of the Communication Sciences Laboratory of the University of Florida located at Marineland, Florida (near St. Augustine).

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Spinner Dolphin

(*Stenella longirostris*)

Distribution and migration. The spinner dolphin inhabits tropical inshore and offshore waters around the world. It has been recorded from the Gulf of Mexico, around the Hawaiian and Line Islands, and U.S. Trust Territory, but not from the U.S. Pacific Coast. It is involved in the U.S. tuna fishery in the eastern tropical Pacific, from Cabo San Lucas to Peru and west to about long. 145° W. Little is known of its migrations. The maximum recorded movement of a single animal is 280 miles (448 km) in 396 days.

Abundance and trends. Population estimates and trends in abundance are not available for this species.

General biology. Length at birth is approximately 0.8 m, and the adults grow to 1.5–2.2 m. Pronounced geographical variations exist in external size and shape, coloration, and skeletal structure. In the eastern tropical Pacific, it commonly associates with the spotted porpoise in mixed aggregations of up to several thousand animals. The spinner dolphin feeds on small pelagic fishes and squids.

Ecological problems. None known.

Allocation problems. Because of its association with yellowfin tuna, this species is taken incidentally by fishermen from Canada, France, Japan, Mexico, Panama, United States, and other countries in coastal and international waters of the eastern tropical Pacific.

Current research. The National Marine Fisheries Service and the tuna fishing industry are assessing the effects of fishing mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. Other research includes systematics and ecological studies by P. J. H. van Bree at the Zoological Museum in Amsterdam, W. Dawbin at Sydney University, and E. D. Mitchell at the Arctic Biological Station of the Fisheries Research Board of Canada in Ste. Anne de Bellevue, Quebec; and ethological studies by K. S. Norris at the University of California at Santa Cruz.

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Striped Dolphin

(*Stenella coeruleoalba*)

Distribution and migration. The striped dolphin inhabits temperate and tropical waters around the world, and has been recorded from both U.S. coasts. Nothing is known about the movements of striped dolphins in waters contiguous to the United States.

Abundance and trends. Population estimates and information on trends are not available for the U.S. or eastern tropical Pacific populations. The Japanese currently take about 5,000 striped dolphins per year (Kasuya, 1972).

General biology. Biological studies have been carried out on the population off Japan. The mean length of the newborn is 1 m, and the gestation period is 12 months long. The mean age at sexual maturity in males and females is 9 years, at 2.2 and 2.1 m, respectively. Lactation lasts about 18 months, and the mean length of the reproductive cycle is about 3 years. Schools of striped dolphins segregate somewhat by age and sex.

Ecological problems. None known.

Allocation problems. The striped dolphin is involved in the tuna fishery to a very minor extent; schools of this mammal apparently do not usually associate with the tuna.

Current research. A federal program of research recently begun by Japan is expected to yield an estimate of population size in the northwestern Pacific Ocean.

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Common Dolphin, Saddleback Dolphin (Atlantic Coast), Whitebelly Porpoise (Pacific Coast)

(*Delphinus delphis*)

Distribution and migration. This species is world wide in distribution in temperate to tropical waters of from 12°–28° C. There may be more than one species, recognizable differences do exist between populations. In the Northwestern Atlantic Ocean, this mammal ranges from Newfoundland to the Caribbean Sea. In the northeastern Pacific Ocean, the primary distribution of this species is from the California-Oregon border to Costa Rica, but one stranded animal was found in British Columbia. Large populations occur off southern California (Santa Barbara to San Diego), the west coast of Baja California, Mexico (Cedros Island to Cape San Lucas), and Costa Rica. A relatively large population also occurs in, and may be resident of, the Gulf of California. In southern California waters *Delphinus* is present throughout the year but is most abundant from August to

January. A decrease in herd size during the spring and summer may be due primarily to the animals breaking up into small subgroups of 50 to 200 animals, and a general movement offshore and north.

Abundance and trends. The common dolphin is probably the most widespread and abundant delphinid. Herds of several thousand individuals have been reported. This species has been utilized in the Black, Mediterranean, and South China Seas, and off the east coast of Japan. Sleptsov (1940) estimated the Black Sea catch at 110,000 to 120,000 per year. Based on data from aerial surveys, Evans (pers. comm.) estimates a population of 10,000–15,000 in the limited area of the southern California continental borderland. The species has been displayed at Marineland of the Pacific and has been used in experiments and field studies by the National Marine Fisheries Service and the Department of the Navy.

General biology. The males grow to 2.6 m and are an average of 14 cm longer than females. The average individual of the northeastern Pacific Ocean is larger than that of the Black and Mediterranean Seas. The largest known specimen from the Black Sea was 212 cm, however, a male 259 cm long was taken from the northeastern Pacific Ocean. Males and females may segregate between mating seasons, especially when the latter are nursing calves or about to bear their young. The gestation period lasts 10–11 months with a post-parturition estrus. The young are 75–85 cm at birth. The young dolphin is weaned at about age 5–6 months (110–120 cm overall length), but may stay with the female up to 1 year. In the northeastern Pacific Ocean, this species appears to have two mating seasons (January–April and August–November), and two calving seasons (March–May and August–October). Herds containing 2,000 to 5,000 dolphins may form, but they appear to be made up of subgroups of 50 to 200 animals. This species is seldom found inside the 100-fathom line, but it frequents sea mounts, escarpments, and other prominent offshore features. The animal makes most of its dives in excess of 10 fathoms after sunset. The deepest dive recorded is 140 fathoms, but the average dive is to 30 fathoms. During feeding the animal usually stays under water for 2–3 minutes, but dives of 5 minutes have been recorded. This species is one of the fastest swimming cetaceans and has been clocked at a burst speed of 25–26 knots. Normal cruising speed is about 4–5 knots, with herds moving 40–50 nautical miles in 24 hours. It feeds mainly on anchovy, sprat, pelagic pipefish, and cephalopods in the Black Sea; whiting, horse mackerel, sardine, and hake in the Atlantic Ocean; and anchovy, myctophids, hake, and cephalopods in the northeastern Pacific Ocean.

Skin parasites are rare, but barnacles sometimes attach themselves to the trailing edge of the tail flukes. Remoras are also found on *Delphinus*, especially in tropical waters. Endoparasites include trematodes in the bile ducts, liver, intestine, and stomach; cestodes in the intestine, blubber, and mesentery; nematodes in the intestine, lungs, nasal sacs, and middle ear cavity; and acanthocephalans in the intestine. The brains of 12 stranded specimens contained flukes and their eggs, which in most cases had caused abscesses and lesions.

Ecological problems. Large sharks and the killer whale are the only known natural predators.

Allocation problems. Because the northern anchovy and squid constitute the bulk of this mammal's diet in the northeastern Pacific Ocean, a substantial increase in the fishery for these resources could have a noticeable effect on the porpoise populations. *Delphinus* is the third most important species of porpoise taken incidentally in the eastern tropical Pacific tuna purse seine fishery. Mexican tuna purse seiners fishing for skipjack in the eastern tropical Pacific and the Gulf of California account for an unknown amount of incidental catch.

Current research. The National Marine Fisheries Service and the tuna fishing industry are assessing the effects of fishing mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. Studies of behavior, distribution, and abundance have been conducted by the Naval Undersea Center, San Diego, California, since 1968. This research will terminate at the end of FY '73.

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NORTHERN RIGHT WHALE DOLPHIN

(*Lissodelphis borealis*)

Distribution and migration. Little is known about the distribution of the northern right whale dolphin other than that it inhabits temperate waters of the North Pacific Ocean.

In the western North Pacific Ocean, the northern right whale dolphin is found from Cape Inubo, Japan, north as far as Etorofu and Paramushir Islands, from where it apparently migrates southward in autumn or winter to near the southern Kurils and is common, at least seasonally, in the northern Sea of Japan.

In the eastern North Pacific, this species has been reported from 30° to 50° north latitudes, though mostly from California. It occurs in the southern California continental borderland only from October or November to about April.

Though it is also oceanic, the right whale dolphin has been observed most frequently along the continental slope and near such features as sea mounts and banks. It has been seen close to the California Channel Islands and the mainland coast near San Diego and Palos Verdes. Two sightings and one specimen from the central Pacific suggest that the species may be continually distributed across the temperate North Pacific.

Abundance and trends. Groups of 200 are most common, but herds of an estimated size from 300 to 1,000 off Japan and up to 2,000 off southern California have been seen. Although the species was once thought to be uncommon, aerial surveys have revealed that it is abundant off the Pacific Coast of North America (Leatherwood, pers. comm.). This species is reportedly common in the northern Sea of Japan (Okada and Hanaoka, 1940), where it is harvested.

General biology. Newborn animals are about 0.6 m in length and grow to 3.1 m. The species is gregarious and is frequently reported in close association with the white-sided dolphin, with which it shares an extensive common range.

Right whale dolphins may reach speeds in excess of 25 knots in bursts. One entire herd averaged over 15 knots for 30 minutes while attempting escape from a helicopter. When approached, the animals may move away quietly or in a series of low angle leaps, each covering as much as 7 m. Individuals that are widely scattered when approached, bunch together tightly while fleeing from the cause of their disturbance.

Food is primarily squid, but also miscellaneous fishes, including myctophids and engraulids.

Parasites include trematodes and cestodes.

Ecological problems. If migrations are food dependent, decimation of food supplies in the southern end of its range could adversely affect the species.

Allocation problems. None known.

Current research. The only research known is an unfunded examination of all museum materials, collection of beached specimens, and survey of literature being conducted by J. S. Leatherwood, NUC, San Diego, R. F. Green, Ventura College, California, and W. A. Walker, Palos Verdes, California.

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Broad-Beaked Dolphin

(*Peponocephala electra*)

Distribution and migration. *Peponocephala* inhabits the tropical Atlantic, Indian, and Pacific Oceans.

Abundance and trends. The status of this species is unknown, except that it is apparently rare (Nishiwaki and Norris, 1966).

General biology. Unknown.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

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Pygmy Killer Whale

(*Feresa attenuata*)

Distribution and migration. The pygmy killer whale probably inhabits most tropical waters.

Abundance and trends. The status of this species is unknown except that it is apparently rare (Caldwell and Caldwell, 1971). The species has been captured for exhibit in the oceanariums of Hawaii and Japan.

General biology. The adults reach about 2.4 m. In appearance they resemble a small false killer whale. They are aggressive in captivity.

Ecological problems. None known.

Allocation problems. This species has been reported taken incidentally to a very minor extent in the yellowfin tuna fishery in the eastern tropical Pacific.

Current research. None.

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False Killer Whale

(*Pseudorca crassidens*)

Distribution and migration. The false killer whale ranges through all temperate and tropical seas. It is an oceanic form, found on the Atlantic side of the United States from North Carolina south, and on the Pacific side from the Aleutian Islands south.

Abundance and trends. This species is uncommon throughout most of its range. It is seldom caught in the Japanese small whale fishery but is common on the Pacific side of Honshu (Ohsumi, 1972).

General biology. The males grow to 6.1 m and the females to 4.9 m; adult animals weigh up to 1,360 kg. Mating appears to be over a protracted period, with young born at about 1.8 m. False killer whales are found in schools of both sexes and all ages. They have been seen eating dolphinfish (mahi-mahi) off Hawaii.

Ecological problems. Schools of up to 835 of these animals have stranded.

Allocation problems. The Japanese state that a toothed whale (shachi), which may or may not be the false killer whale, does much damage to their long-line tuna industry by feeding on hooked fish.

Current research. None.

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Common Pilot Whale, Pothead, Blackfish

(*Globicephala melaena*)

Distribution and migration. This pilot whale inhabits the North Atlantic Ocean south to Virginia and the Mediterranean. It is a schooling mammal and appears regularly off the Canadian and United States coasts. It generally favors pelagic regions, but often moves close to shore in search of food.

Abundance and trends. The status of this species is unknown. A total of 3,000 to 4,000 was killed annually in local Newfoundland fisheries up to the early 1950's (Sergeant, 1962), but only a few have been taken in recent years. About 177,000 were taken in the Faroe Islands from 1584 to 1883 (Tomilin, 1957) and several hundred per year are still being harvested there and in Norway.

General biology. The adults grow to about 6.5 m; females are usually mature at age 6 to 7 years and males at about age 12. Calves are about 1.8 m long at birth, in July to August, although full-term fetuses have been found year round. Cows probably bear calves every 3 years, the gestation period is about 16 months, and lactation lasts about 2 years. Pilot whales are gregarious, and occur in schools of hundreds and thousands. They have a distinct social organization, however, the sex ratio is not always equal in stranded groups. They are believed polygamous by some, with bachelor males sometimes forming separate schools. They travel in tight schools when not feeding, and disperse into scattered groups when on feeding grounds. Captive pilot whales feed at night and sleep days. They have a top swimming speed of over 25 mph, and a longevity of about 50 years. They feed almost exclusively on squids, but also eat small fish such as clupeids and gadids. Sergeant estimates food intake per year at about 11.5 times the weight of the animal.

Ecological problems. Whole schools sometimes strand.

Allocation problems. None known.

Current research. None.

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Short-Finned Pilot Whale

(*Globicephala macrorhyncha*)

Distribution and migration. In the North Atlantic Ocean, this pilot whale ranges north to New Jersey and Madiera. In the North Pacific Ocean it is found from Japan and the Aleutian Islands south to at least northern Brazil and Dakar, Senegal, and probably Peru. It is an oceanic species with a very wide range. Schools of pilot whales appear regularly off U.S. coasts. It generally favors offshore waters, but often moves close to land in search of food. Greatest numbers are seen in the eastern North Pacific in winter, fewer in summer.

Abundance and trends. The status of this species is unknown except that it is fairly abundant around the California Channel Islands (Norris and Prescott, 1961). The population of pilot whales around the Channel Islands has been fished for live specimens to supply U.S. oceanaria since about 1955. Many pilot whales are taken in the Japanese small-whale fishery. This species is also taken in the lesser Antilles.

General biology. The adults grow to 4.6–6.7 m. Little work has been done on this species, but indications are that the general biology is similar to *G. melaena*.

Ecological problems. Schools of this species often strand.

Allocation problems. None known.

Current research. The taxonomy of Pacific *Globicephala* is being studied by R. L. Brownell and D. K. Caldwell in the United States, and T. Kasuya and M. Nishiwaki in Japan. The U.S. Navy is studying the behavior and distribution of the pilot whale.

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KILLER WHALE

(*Orcinus orca*)

Distribution and migration. The killer whale is worldwide and ranges north and south to polar ice. It is more common in cooler waters, and in more productive coastal areas. The Strait of Georgia in British Columbia, Prince William Sound in Alaska, and Puget Sound in Washington State are areas of concentration. Migratory habits are probably dependent on food supply, and killer whales are most numerous in Puget Sound in November and late summer. In Japan, most of these mammals are taken from April to November, with the greatest number from August to November. In the Norway fishery, killer whales seem dependent on distribution and migration of herring, capelin, and cod.

Abundance and trends. Authoritative estimates of the world population are not available. A limited cooperative effort of the Fisheries Research Board of Canada and the Washington State Department of Game primarily in the inside waters of Washington and British Columbia gave counts of 459 killer whales in 1971, 255 in 1972, and 249 in 1973. About 66 individuals have been removed from inside waters of British Columbia and northern Washington State during the past 7 years for display by marine aquariums. An additional nine were killed during U.S. capture operations, mostly during the early years. The number of killer whales killed in Canadian capture operations is not known. The Japanese fishery took 567 killer whales from the Okhotsk Sea to south of Japan from 1948 to 1957. Norwegians harvested 1,417 in the northeastern North Atlantic between 1938 and 1967.

General biology. Females grow to 7.0 m and males to 8.2 m. Males weigh up to about 8,000 kg, with about 4,000 kg the apparent limit for females. An adult male dorsal fin may be 1.8 m high, considerably higher than that of the female Breeding appears to occur year-round although it may peak in May to July; gestation lasts 13 to 16 months. Newborn calves are about 2.4 m long and weigh about 180 kg. In the Northern Hemisphere births occur mostly in autumn. Killer whales usually are found in groups of about 10 to 100 or even more. The males are probably polygamous. Killer whales hunt successfully in packs, but there are no records of attacks on people. The stomach contents of 364 killer whales taken off Japan from 1948 to 1957 included (in order of occurrence): fish (mostly cod, flatfish, and sardines), squid, octopus, dolphins, whales, and seals. Salmon constituted 1.6% of all stomach contents. Soviets in the Kurils recorded "fish and squid" but no marine mammal remains in 10 animals. Of 10 killer whales examined by the National Marine Fisheries Service, Seattle, 6 adult males had only marine mammal remains except for 1 squid; 1 adult female and 1 immature male had only fish remains.

The most common diseases are those caused by wearing of tooth crowns and denudation of the pulp cavity, which results in abscesses. Other diseases include bony outgrowths and bone tumors. Parasites include nematodes, cestodes, and trematodes. One Puget Sound killer whale stomach contained 5,000 nematodes.

Ecological problems. This species has no natural enemies except man. Stranding probably is the greatest nonhuman hazard.

Allocation problems. Public interest in killer whales was stimulated by the first live capture in 1964 in British Columbia. Growing public interest is increasing in killer whales as a recreational resource, especially in Puget Sound. The animals are commercially valuable in the United States for display in oceanariums. U.S., Japanese, and Canadian fishermen contend that the whales cause gear damage and interfere with salmon and tuna longline fisheries. Many consider killer whales an important predator of salmon and herring; others defend them as the natural enemy of other fish eaters, including harbor seals and sea lions. Some sport salmon fishermen claim their presence spoils fishing.

Current research. The National Marine Fisheries Service and the Fisheries Research Board of Canada are studying killer whale distribution in western U.S. and Canadian waters.

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HARBOR PORPOISE

(*Phocoena sinus* and *Phocoena phocoena*)

Distribution and migration. There are four recognized species of harbor porpoise, but only the two found in the waters of the Northern Hemisphere are discussed here. One species, *Phocoena sinus*, is apparently restricted in range to the Gulf of California. *P. phocoena* is circumpolar in distribution in ice-free seas, ranging south in the Atlantic Ocean to the Delaware River and the Mediterranean Sea. In the Pacific Ocean it is found south to Japan and southern California, although it is not abundant south of San Francisco.

The harbor porpoise is an inshore species, frequenting coastal waters, the mouths of large rivers, harbors, and bays, and sometimes ascending freshwater streams.

Abundance and trends. The harbor porpoise is especially abundant in the waters of Washington (Scheffer and Slipp, 1948) and western Canada (Pike and MacAskie, 1969). Tomlin (1957) reports single catches of 2,000 to 2,500 harbor porpoises at the time they migrate between the Sea of Azov and the Black Sea.

Mohl-Hansen (1954) reporting on biological investigations of the harbor porpoise in Danish waters examined 188 harbor porpoises in 1941–42, 230 in 1942–43, and 212 in 1943–44, so at least those numbers were commercially harvested in Denmark during those years. He also states that these harbor porpoises were from the Baltic Sea populations.

General biology. This species grows to 1.8 m, and weighs up to 72 kg. The females are sexually mature at about age 3–4 years. Newborn calves are half the length of the mother. They breed annually during late spring and summer. The gestation period is 10–11 months, and the calves nurse up to 8 months. Harbor porpoises travel in pairs and schools of up to 200 or more, especially on the feeding grounds. This species is less playful than most dolphins or porpoises; they seldom jump out of the water, and usually ignore passing boats. Schools containing all "bachelors" are common; the females stay in groups of mixed sex. Usually they swim just below the surface, rising about 4 times per minute to breathe when not feeding. They feed mainly on bottom fishes such as cod, herring fry, flounder, and occasionally on invertebrates such as squids, clams, and crustaceans.

Ecological problems. These animals occasionally strand for unknown reasons, and because of their feeding habits, a few tend to get trapped in fishermen's nets.

Allocation problems. None known.

Current research. None.

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Dall Porpoise

(Phocoenoides dalli)

Distribution and migration. The Dall porpoise inhabits the North Pacific Ocean from Japan and southern California to the Bering and Okhotsk Seas. It appears to migrate twice yearly off the coasts of Japan and California, and may move inshore in winter and offshore in summer. The Dall porpoise is a regular winter visitor to southern California, and has been observed in the Channel Islands area from October to summer. It has been seen off San Francisco Bay from March to October, off Monterey Bay throughout the year, and may be present year round where food is adequate.

Abundance and trends. The Dall porpoise is one of the most abundant small cetaceans found in Alaskan inside waters (U.S. Forest Service) and in British Columbia waters (Pike and MacAskie, 1969). It is commonly seen off northern California (W. J. Houck, pers. comm.). Mizue and Yoshida (1965) report an annual accidental catch of more than 10,000 Dall porpoise in the Japanese high seas salmon gillnet fishery in the northern North Pacific and Bering Sea west of 175° W longitude. They also state that the Dall porpoise is abundant east of 175° W longitude but that the Japanese fishing fleet does not operate east of the boundary. The Marine Mammal Division has many records of Dall porpoise ranging from the Bering Sea and the eastern Aleutian Islands south to latitude 34° in California waters (MMD files, Marine mammal observations, 1958–72).

General biology. The Dall porpoise grows to about 2.2 m and a weight of about 218 kg. It and the killer whale have the most conspicuous color patterns among cetaceans. Calves are born in the spring and summer, and young are observed in August. These animals are usually found in groups of 2 to 20, but occasionally 200 or more are seen on favorable feeding grounds. It plays in the bow waves of ships, and is among the swiftest of all marine mammals. This mammal consumes squid and such fish as saury, hake, herring, jack mackerel, and bathypelagic and deep-water benthic fish.

Ecological problems. None known.

Allocation problems. None known.

Current research. W. J. Houck is studying *P. dalli* and *P. truei* at Humboldt State College in California, and M. Nishiwaki is studying these species in Japan. G. V. Morejohn is studying feeding habits, migration, behavior, and morphology of the species at the Moss Landing Marine Station, California.

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Beluga (Belukha), White Whale

(Delphinapterus leucas)

Distribution and migration. The beluga inhabits the Arctic Ocean and adjacent seas, including the Okhotsk and Bering Seas, Cook Inlet, Hudson Bay, and Gulf of St. Lawrence. Belugas ascend several hundred miles up the larger rivers of Siberia and Alaska. Populations of white whales from different areas show marked size differences throughout the Arctic. Three races are recognized: *dorofeevi* from the Okhotsk Sea; *marisalbi* in the Barents and White Seas; and *leucas* in the rest of the range. In the Pacific belugas are common along the Alaska coast as far south as Bristol Bay and an apparently separate population is found in Cook Inlet.

Abundance and trends. In Alaska belugas have been used as a source of muktuk, meat, and oil for both people and dogs by residents of villages on the Bering Sea and Arctic Ocean coasts and along rivers that belugas periodically ascend. Belugas also provide a significant amount of fresh and preserved food for native peoples in the Mackenzie River delta region and Baffin Island, where beluga hunting is culturally and economically important (Brodie, pers. comm.). In recent years the demand for beluga products has been reduced in the Arctic. Lensink (1961) estimated an annual harvest of 400 to 500 belugas in Alaska. In Bristol Bay only a few belugas are now taken, and the estimated annual harvests of the Bering Sea–Arctic Ocean coasts is 150 to 300 (Alaska Department of Fish and Game, 1973). The Cook Inlet, Alaska, population is estimated at 300 to 500. In Bristol Bay the population is estimated at 1,000 to 1,500 and is considered stable. The size of the beluga population in Alaska north of Bristol Bay is unknown, but is much greater than that residing in Bristol Bay (op. cit.). Sergeant (1962) states that from 1948 to 1960 the catch of belugas in the Canadian arctic averaged 1,200 annually. The present catch in Canada averages 500 animals per year (Brodie, pers. comm.). In the late 1950's the annual catch of belugas averaged 3,000–4,000 in the U.S.S.R., 500–800 in Greenland, and 100–200 from Spitsbergen (Kleinberg et al., 1964).

General biology. Males grow to 4.6 m and the females to 4.0 m in the Beaufort Sea, and to 5.2 m and 4.6 m, respectively, in the Soviet arctic. The beluga is polygamous, breeds in the spring, has a gestation period of 13–14 months, and newborn are about 1.5 m in length. Lactation lasts about 2 years, resulting in a 3-year reproductive cycle. They are gregarious and travel in groups of 2 or 3 to hundreds. Belugas feed from midwater to the bottom, with a diet including fish such as salmon, capelin, cisco, pike, char, cod, squid, crustaceans, and nereid worms. They frequently occur in shallow areas with a bottom of mud, sand, and stones. The beluga produces high-pitched whistles and squeals, ticking and clucking sounds, and have been given the name "sea-canary." Animals break the ice with their backs to reach air for breathing.

Parasites include nematodes in the respiratory organs, ears, circulatory system, intestine, and urogenital system; trematodes are found in the intestine, as well as cestodes and acanthocephalans. Helminths are apparently one cause of mortality.

Ecological problems. Known natural enemies include the killer whale and polar bear.

Allocation problems. These mammals take salmon at the mouths of large Alaskan rivers, and are important predators of salmon smolt in Bristol Bay, Alaska. Recorded killer whale sounds have been used experimentally to prevent beluga predation in the Kvichak River.

Current research. Research on the beluga is being conducted by the Fisheries Research Board of Canada.

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NARWHAL

(*Monodon monoceros*)

Distribution and migration. The narwhal is the most northern cetacean and occurs in north polar seas, including the entire Arctic Ocean, but is mainly found in the North Atlantic Ocean region. It is most common in northwestern Greenland and the eastern Canadian arctic, particularly Jones and Lancaster Sounds, the north and east coasts of Baffin Island, Repulse Bay, and occasionally in northern Foxe Basin and Hudson Strait. Narwhals also occur near Franz Josef Land and Novaya Zemlya. They are rare in the Laptev, East Siberian, Chukchi, and Beaufort Seas.

Abundance and trends. The Canadian population is estimated at about 10,000, with smaller numbers in northwestern Greenland (Mansfield, pers. comm.). Numbers elsewhere are unknown. Extremely rare occurrences in Great Britain (4) and Holland (1) are documented. Narwhals are hunted in Greenland and the eastern Canadian arctic for dog food, muktuk, sinew, and ivory.

General biology. Narwals grow to 4.6 m in length and adult males to 1,550 kg. The young are born in May and June at about 1.5 m in length. Males have a tusk (canine tooth) which is usually the left one and occasionally both. Sometimes females also have a tusk. The tusk grows as a spiraled rod to 2.0 m in length, and distinguishes narwhals from all other whales. Gestation appears to last about 14 months, since well-developed fetuses are present in July and August. Usually only one calf is produced. Narwhals are gregarious, forming schools of up to one or two thousand, made up of small groups of up to about 20 (Mansfield, pers. comm.). Speculations on the tusk function are numerous and the tusk may only be a secondary sexual characteristic. Food of the narwhal consist mainly of cephalopods, polar cod, and Greenland turbot.

Ectoparasitic whale lice occur in cuts, skinfolds, and around the base of the tusk. Endoparasitic nematodes occur occasionally in the stomach, and frequently in basicranial sinuses.

Ecological problems. Narwhals are occasionally trapped in large numbers by rapid freeze-up. In such situations, Greenlanders may kill entire groups of these mammals. Although it is not adapted to drift ice areas, the killer whale probably occurs there and may be a natural enemy of the narwhal.

Allocation problems. None known.

Current research. The narwhal is being studied by the Fisheries Research Board of Canada.

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SPERM WHALE

(*Physeter catodon*)

Distribution and migration. The sperm whale is nearly world wide in distribution except for the pack ice of the polar regions. Females and immature animals are generally found between 40° S and 50° N latitudes. Sperm whales appear to migrate north during the northern summer and south during the northern winter. In the North Pacific, male sperm whales are found as far north as the Bering and Okhotsk Seas; in the North Atlantic they move into Davis Strait and near Spitzbergen.

Abundance and trends. Information on this section is from the annual reports of the International Whaling Commission (1972, In press) and from recent reports of the Bureau of International Whaling Statistics. Stocks available for commercial harvest are estimated at about 70,000 males and 184,000 females for the North Pacific and 128,000 males and 295,000 females for the southern oceans. Estimates of the number of immature animals are not available. The Northwest Atlantic has an estimated total stock of all ages of about 22,000. The sperm whale is currently the most important species of the world whaling industry. Stocks in most areas are above maximum sustainable yield levels.

Catches of sperm whales in recent seasons have been:

Season/North Pacific	Atlantic	Southern oceans, pelagic[1]	Southern land stations
1969:			
11,329 males	[2] 640	5,390	4,011
3,005 females			
1970:			
11,236 males	649	5,891	4,138
3,579 females			
1971:			
8,295 males	559	7,335	4,498
2,595 females			
1972:			
4,032 males	117	8,172	2,659
2,291 females			

[1] Southern oceans catches are for the seasons 1969–70, 1970–71, 1971–72, 1972–73, respectively.

[2] All catch data except North Pacific include males and females.

General biology. The sperm whale's large squarish head is distinctive because it bears a tank-like "case" containing spermaceti. The lower jaw is long and narrow, and has about 25 pairs of teeth. Females reach 11.6 m in body length, males 16.8 m. This species dives to at least about 1,000 m, can remain submerged for about an hour, and feeds mainly on large squid. It also consumes significant quantities of octopuses and demersal and mesopelagic fishes. Females and juveniles of both sexes form schools of 10–50 animals, averaging about 25. Younger, sexually mature males (ca. 11.0–13.4 m, age 15–25 years) form "bachelor" schools usually containing not more than 10 animals. Older males (13.7 m, 22–27 years) are usually solitary except when with schools of females for breeding for about 5 months in the spring and early summer. The females mature sexually at about age 8 to 11 years when body length is about 8.5 to 9.1 m, physically at 25 to 30 years and a body length of 11.0 m. Males are not sexually mature until about 19 years and 11.9 m, and are not "socially" mature until about age 25 years. Growth of males continues until they are 45 to 60 years old, and about 15.5 m long. The female bears a calf (about 4.0 m) once every 3 to 5 years. Gestation lasts 14–15 months, and the calf nurses 1–2 years and is weaned at about 6.7 m long.

Ecological problems. None known.

Allocation problems. None known.

Current research. The National Marine Fisheries Service is studying the life history of the sperm whale. Other organizations carrying out research on this species are the Japanese Whales Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), British National Institute of Oceanography (South Africa and western South America), South African Division of Sea Fisheries (South Africa), Australian Commonwealth Scientific and Industrial Research Organization (Australia), the University of Chile (Chile), the Marine Institute of Peru (Peru), and the Marine Department of New Zealand (New Zealand).

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Pygmy Sperm Whale

(*Kogia breviceps*)

Distribution and migration. The pygmy sperm whale occurs in all the warmer seas of the world. In the Pacific Ocean it ranges north to Washington and Japan; in the Atlantic Ocean it ranges north to Nova Scotia and the Netherlands.

Abundance and trends. The status of this species is unknown other than the fact that it is apparently rather rare. There are many more records of stranding than there are for *Kogia simus*, the dwarf sperm whale (C. O. Handley, Jr., pers. comm.). This species is occasionally taken in the Japanese small-whale fishery (Yamada, 1954).

General biology. Adult pygmy sperm whales are 2.7 to 3.4 m long. Their dorsal fin is low and posterior to the center of the back. This species was long confused with the dwarf sperm whale, and the following composite statement is based on both species. They are usually solitary or in small pods. They feed mostly on squid but also take pelagic crustaceans such as shrimps and giant mysids. Females simultaneously pregnant and lactating have been found, suggesting that they may bear a calf 2 years in succession.

Parasites include tapeworm cysts in the blubber, roundworms in the stomach, and giant kidney worms.

Ecological problems. None known.

Allocation problems. None known.

Current research. D. K. Caldwell and M. C. Caldwell have been gathering data on the life history in Florida (D. K. Caldwell, pers. comm., 1974). D. K. Caldwell, M. C. Caldwell, and C. O. Handley, Jr. have been working on the distribution (seasonal as well as geographical) in southeastern U.S. (Caldwell, pers. comm., 1974).

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Dwarf Sperm Whale

(*Kogia simus*)

Distribution and migration. The dwarf sperm whale apparently has a discontinuous distribution around the world. It has been found in the seas adjacent to South Africa, India, Ceylon, Japan, Hawaii, South Australia, and the west and east coasts of the United States. On the west coast it has been recorded only from Cabo San Lazaro, Baja California, and San Luis Obispo County, California. On the east coast it ranges from Cape Henry, Virginia, south and west to Texas.

Abundance and trends. The status of this species is unknown other than the fact that it is apparently rather rare over much of its range. However, it strands rather frequently on the southeast coast of the United States and is taken in the Japanese small-whale fishery (Yamada, 1954).

General biology. Adult dwarf sperm whales are 2.1 to 2.7 m long. Their dorsal fin is high and near the center of the back. This species was long confused with the pygmy sperm whale, and the following is a composite statement based on both species. They are usually solitary or in small pods. They feed mostly on squid but also take pelagic crustaceans such as shrimps and giant mysids. Females simultaneously pregnant and lactating have been found, suggesting that they may bear a calf 2 years in succession.

Parasites include tapeworm cysts in the blubber, roundworms in the stomach, and giant kidney worms.

Ecological problems. None known.

Allocation problems. None known.

Current research. D. K. Caldwell and M. C. Caldwell have been gathering data on the life history in Florida (D. K. Caldwell, pers. comm., 1974). D. K. Caldwell, M. C. Caldwell, and C. O. Handley, Jr. have been working on the distribution (seasonal as well as geographical) in southeastern U.S. (Caldwell, pers. comm., 1974).

References

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North Sea Beaked Whale

(*Mesoplodon bidens*)

Distribution and migration. The North Sea beaked whale ranges mostly from the western Baltic Sea and central Norway south to the Bay of Biscay. It has been recorded in the western North Atlantic Ocean from Newfoundland and Massachusetts. Its migrations are unknown.

Abundance and trends. The status of this species is unknown, except that it is apparently rare (More, 1966).

General biology. This species is the only one of its genus for which even rudimentary life history data are available. These beaked whales attain a maximum length of 5.5 m for males and 4.9 m for females. Mating and birth usually take place in late winter and spring. The gestation period is about 1 year. At birth the calf is between 1.8 and 2.1 m long, nurses for about 1 year, and at weaning is probably about 3.0 m long.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

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Antillean Beaked Whale

(*Mesoplodon europaeus*)

Distribution and migration. The Antillean beaked whale ranges from Trinidad, Jamaica, and the Gulf of Mexico, north to Long Island, New York. One record for the English Channel has been obtained. Its migrations are unknown.

Abundance and trends. The status of this species is unknown, except that it is apparently rare (Moore, 1966).

General biology. These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

References

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True's Beaked Whale

(*Mesoplodon mirus*)

Distribution and migration. The True's beaked whale has been found in the western North Atlantic Ocean from Nova Scotia south to northern Florida, and in the eastern North Atlantic Ocean from the Outer Hebrides south along the west

coast of Ireland. There is another population off the coast of South Africa. Its migrations are unknown.

Abundance and trends. The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General biology. These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

REFERENCES

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1968. Relationships among the living genera of beaked whales with classifications, diagnoses and keys. Fieldiana: Zoology, 53(4): 209–298.

BERING SEA BEAKED WHALE

(*Mesoplodon stejnegeri*)

Distribution and migration. The Bering Sea beaked whale is endemic to the North Pacific Ocean. It ranges from the Commander and Pribilof Islands, Bristol Bay, and the northern Gulf of Alaska south to the Sea of Japan on the western side and Oregon on the eastern side. Its migrations are unknown.

Abundance and trends. The status of this species is unkown, except that it is apparently rare (Moore, 1966; 1968).

General biology. These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

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Nishimura, S., and M. Nishiwaki. 1964. Records of the beaked whale *Mesoplodon* from the Japan Sea. Publ. Seto Mar. Biol. Lab., 12(4): 323–334.

ARCH-BEAKED WHALE

(*Mesoplodon carlhubbsi*)

Distribution and migration. The arch-beaked whale has been recorded only in the North Pacific Ocean, from the Sanriku coast of Hokkaido on the western side and from British Columbia south to southern California on the eastern side. Its migrations are unknown.

Abundance and trends. The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General biology. These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

REFERENCES

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Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish. Res. Bd. Can. Bull. 171: 1–54.

GINKGO-TOOTHED WHALE

(*Mesoplodon ginkgodens*)

Distribution and migration. The ginkgo-toothed whale has been recorded from Ceylon, in the western North Pacific Ocean from Taiwan to the Sanriku coast of Hokkaido, and in the eastern North Pacific Ocean at Del Mar in southern California. Its migrations are unknown.

Abundance and trends. The status of this species is unknown, except that it may not be so rare in the western part of the North Pacific as once thought (Nishiwaki et al., 1972).

General biology. These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological problems. None known.

Allocation problems. None known.

Current research. None. Present knowledge is based on opportunistic examination of specimens.

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DENSE-BEAKED WHALE

(*Mesoplodon densirostris*)

Distribution and migration. The dense-beaked whale is widely, but perhaps discontinuously, distributed in tropical and warm temperate waters around the world. In the North Pacific Ocean it has been recorded from Taiwan, Japan, and Midway Island. In the North Atlantic Ocean it has been recorded from Nova Scotia south to the Bahamas on the western side, and from Madeira on the eastern side.

Abundance and trends. The status of this species is unkown, except that it is apparently rare (Besharse, 1971; Moore, 1966).

General biology. These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological problems. None known.

Allocation problems. None known.

Current research. None.

REFERENCES

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GOOSE-BEAKED WHALE

(*Ziphius cavirostris*)

Distribution and migration. The goose-beaked whale is found in all oceans except Arctic and Antarctic waters. In the North Pacific Ocean it ranges north to Hokkaido, the Commander and Aleutian Islands, and the Queen Charlotte Islands. In the North Atlantic Ocean it ranges north to Cape Cod, Massachusetts, on the western side and the Shetland and Orkney Islands on the eastern side. Its migrations are not understood.

Abundance and trends. The status of this species is unknown. The goose-beaked whale is the most frequently observed ziphiid, at least in the eastern North Pacific Ocean, and throughout its range has been found stranded far more often than any other species of the family (Mitchell, 1968). Between 13 and 16 goose-beaked whales have been taken annually in the Japanese small-whale fishery during the past 5 years (Nishiwaki and Oguro, 1972).

General biology. The goose-beaked whale is distinguishable from other ziphiids by its relatively short beak, the dorsal profile of which forms an almost straight line with the steeply sloping forehead, and by its brown coloration; older males have snow-white heads. The maximum body length in both sexes is about 7.0 m. These whales usually travel in tight schools of up to about 10 individuals, but old males are often solitary. Their main foods are squids and deep-water fishes. Sexual maturity is attained at a length of about 5.5 m in both sexes.

Ecological problems. None known.

Allocation problems. None known.

Current research. Research on this species has been conducted incidentally to other studies in Japan by the Whales Research Institute and the Ocean Research Institute.

REFERENCES

Mitchell, E. 1968. Northeast Pacific stranding distribution and seasonality of Cuvier's beaked whale *Ziphius cavirostris*. Can. J. Zool., 46: 265–279.

GIANT BOTTLENOSE WHALE

(*Berardius bairdi*)

Distribution and migration. The giant bottlenose whale is endemic to the North Pacific Ocean, where it ranges from St. Matthew Island in the Bering Sea south to central Honshu on the western side and southern California on the eastern side. Its migrations are poorly known.

Abundance and trends. The status of this species is unknown except that it is uncommon but not rare. According to information taken from the Bureau of International Whaling Statistics, between 100 and 400 giant bottlenose whales have been taken annually in the Japanese small-whale fishery during the past 20 years.

General biology. This species is the largest of the beaked whales. Males attain a maximum length of 11.9 m and females 12.8 m. Their long narrow beak, bulging forehead, and size distinguish them from other species of beaked whales in the North Pacific Ocean. They usually travel in tight schools of up to 30 individuals. Their main foods are deep-water fishes and squids. Males attain sexual maturity at a length of about 10.0 m, and females at about 10.3 m. Sexual maturity is not attained earlier than age 3 years, and probably much later. Mating takes place mostly in February, and calves are born in December.

Ecological problems. None known.

Allocation problems. None known.

Current research. Research on this species has been conducted incidentally to other studies in Japan by the Whales Research Institute and the Ocean Research Institute; in California by the National Marine Fisheries Service; and in British Columbia by the Fisheries Research Board of Canada.

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Omura, H., K. Fujino, and S. Kimura. 1955. Beaked whales *Berardius Bairdi* of Japan, with notes on *Ziphius cavirostris*. Sci. Rep. Whales Res. Inst., 10: 89–132.

NORTH ATLANTIC BOTTLENOSE WHALE

(*Hyperoodon ampullatus*)

Distribution and migration. This species of bottlenose whale is endemic to the colder waters of the North Atlantic Ocean. On the western side it ranges from Davis Strait south to Rhode Island; on the eastern side it ranges from Novaya Zemlya south to the Azores and English Channel. It migrates south in the autumn and north in the spring.

Abundance and trends. The status of this species is unknown, except that it is fairly common in at least parts of its range. According to records from International Whaling Statistics, between 260 and 700 of these animals have been taken annually throughout the North Atlantic Ocean by the Norwegian small-whale fishery. A few individuals are sometimes taken by whalers operating from Nova Scotia and the Faeroe Islands.

General biology. The bottlenose whale is easily recognized by a conspicuous beak that is sharply demarked from the high bulging forehead which, in old males, becomes almost vertical and flattened in front and slightly overhangs the base of the beak. Bottlenose whales are black when young, turn brown when adult, and almost yellow with a white head when very old. Males attain a maximum length of 10.7 m, and females 9.7 m. They usually travel in small herds of 4 to 10, but the adult males are often by themselves. Their food appears to be mainly squids. Females attain sexual maturity when about 6.5 m long. The calves are born from early spring to early summer.

Ecological problems. None known.

Allocation problems. None known.

Current research. This species is being studied by the Statens Institutt for Hvalforskning, Oslo, Norway.

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MARINE MAMMAL LAWS

Each marine mammal of U.S. concern is protected by one or more U.S. laws or acts, and the conservation of some species is at least partially assured by international treaty or law. A summary of the various laws, conventions, and commissions designed and enacted to protect marine mammals follows:

1. *Marine Mammal Protection Act of 1972.* A U.S. federal law that prohibits U.S. citizens from taking, harassing, or importing any marine mammal or its by-products into the United States, except when authorized to do so by special permit. Indians, Eskimos, and Aleuts of the North Pacific and Arctic Oceans can take

marine mammals for subsistence, and for creating and selling handicraft items and clothing as long as the stocks can support the harvest.

2. *Endangered Species Act of 1973.* This U.S. federal law, which became effective on December 28, 1973, provides for the protective measures and procedures necessary to bring endangered and threatened species to the point at which such species are no longer in danger of extinction. The protective measures include, among other things, prohibition of capturing or killing, or engaging in interstate or foreign commerce in any endangered species of fish and wildlife, except as authorized by a special permit. Certain types of taking for subsistence purposes in Alaska are also allowed. The Act also provides for implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

3. *International Whaling Convention.* The International Whaling Commission (IWC) was established under a convention signed in Washington, D.C. in December 1946. The membership includes all countries that catch significant numbers of whales except Spain, Portugal, Chile, Peru, and Brazil. The IWC is responsible for whale conservation worldwide. Since 1964, the IWC has acted to bring world whaling under control by prohibiting worldwide the taking of some species, sharply reducing the authorized catches of species in certain areas, establishing catch quotas by species, and implementing an international observer plan for policing quotas and regulations at land stations and on factory ships. The IWC appears to be extending its authority to cover all cetaceans and to implement regulations for threatened species. The IWC now regulates the harvest of fin, sei, Bryde's, minke, and sperm whales. A subcommittee of the IWC has been established on small cetaceans to review problems and improve data collection. The gray, bowhead, right, blue, and humpback whales are completely protected, except for some hunting by aboriginals.

4. *Convention on International Trade in Endangered Species of Wild Fauna and Flora.* When this convention becomes effective, it will provide additional protection for the following species: Appendix I—gray, blue, humpback, bowhead, and right whales, northern elephant seal, Ganges River dolphin, Caribbean and Mediterranean monk seals, dugong, and West Indian and South American manatees; Appendix II—southern fur seal, Galapagos fur seal, Juan Fernandez fur seal, southern elephant seal, dugong (Australian), and West African manatee.

5. *Interim Convention on North Pacific Fur Seals.* This Convention prohibits most citizens of Japan, Canada, the U.S.S.R., and the United States from taking northern fur seals. The exceptions are aboriginal Indians, Aleuts, and Eskimos, who may take them only at sea and by primitive methods. The Convention also provides for intensive research on this species by the four countries. The economic utilization of northern fur seals on their breeding grounds is conducted by the respective governments and is regulated on a scientific basis.

6. *International Convention for the Northwest Atlantic Fisheries.* Under terms of a Convention signed in 1949, ICNAF is responsible for the investigation, protection, and conservation of the fisheries of the Northwest Atlantic in order to make possible the maintenance of a maximum sustained catch from these fisheries. The harp seal harvest is regulated by ICNAF, which imposes quotas for the taking of these mammals.

7. *International Convention for the Conservation of Antarctic Seals, 1972.* The purpose of this Convention is to safeguard all species of Antarctic seals and to ensure that, if commercial sealing begins on floating ice of the Southern Ocean, the killing of certain species will be prohibited and the taking of other species will be subject to strict limitations. Measures adopted under the Antarctic Treaty of 1959 provide only for the protection of seals and other animals around the shoreline of the Antarctic Continent, but not on floating ice. The Convention of 1972 may be applicable to any or all of the following seals: Southern elephant, leopard, Weddell, crabeater, Ross, and southern fur seals.

8. *Canadian-Norwegian Agreement on Sealing.* On 22 December 1971, these two governments ratified an agreement on sealing and the conservation of seal stocks in the Northwest Atlantic. The agreement applies to the harp seal, but provision is made for extension to hooded and bearded seals and to the walrus.

9. *Miscellaneous regulations and agreements of some U.S. interest.*—a. *Harp seal.* The U.S.S.R. and Norway signed an agreement in 1958 entitled "Preservation of seals in the Greenland Sea." The agreement provides for the regulation of harp seal catches by these two nations. The U.S.S.R., however, has not hunted harp seals since 1965.

b. *Gray seal.* The U.S.S.R. has prohibited (since 1970) the hunting of gray seals for sport and by amateurs, but permits the taking of these animals for subsistence. Canada uses an 1886 law for authority in regulating the take of gray seals. England has prohibited the hunting of gray seals on the Farne Islands since 1932 and on Orkney Island since 1923. Norway has forbidden hunting at Sör Trondelag (since 1923). Finland and Sweden offer bonuses for gray seals taken.

c. *Hooded seal.* Canada and Norway prohibit the taking of hooded seals near Newfoundland before 10 March, near Jan Mayen Island before 13 March, in Denmark Strait from 15 June to 15 July, and in northern waters from 20 March to 5 May. The U.S.S.R. and Norway in 1958 agreed to prohibit the harvest of hooded seals near Jan Mayen Island before 13 March, and banned hunting in Denmark Strait.

d. *Beaded seal.* The U.S.S.R. has, since 1970, banned the commercial hunting of bearded seals from vessels, and regulates the take of this species by aborigines and the harvest from shore by others.

e. *Ribbon seal.* Since the 1960's, the U.S.S.R. has forbidden the hunting of ribbon seals at sea from 1 March to 1 September, and in 1970 stopped hunting by "amateurs."

f. *Ringed seal.* The U.S.S.R. banned sport hunting of *Pusa hispida hispida* beginning in 1970. Sport hunting of another subspecies (apparently accepted by the U.S.S.R. as *P. h. kraschenininkovi*) was also banned by the U.S.S.R. in that year, local harvests were regulated, and hunting of the subspecies between 1 March and 1 September was prohibited. The U.S.S.R. has also, since 1970, prevented commercial hunting of *P. h. ochotensis* from vessels, and regulated the take of this subspecies by aborigines and the harvest from shore by others.

g. *Harbor seal.—Ice-dwelling populations.* The U.S.S.R. has prohibited sport hunting of these populations of the harbor seal since 1970, protects its rookeries from harassment and pollution, and regulates the harvest.

Land-dwelling populations. The U.S.S.R. has prohibited the sport hunting of these populations since 1970, and regulates the take of harbor seals from the White and Barents Seas.

h. *Northern sea lion.* The U.S.S.R. regulates the harvest of northern sea lions and protects its rookeries from harassment.

i. *Walrus.* In 1958, the U.S.S.R. and Norway agreed to ban the hunting of walrus except to satisfy local needs and those of expeditions.

j. *Guadalupe fur seal.* Mexico has safeguarded the breeding grounds of the Guadalupe fur seal on the Guadalupe Islands by making this island a wildlife refuge.

k. *South American fur seal.* The Uruguayan and Argentinian Governments protect the South American fur seal on land and out to 200 miles at sea. In addition, the Uruguayan Government regulates the harvest by protecting all female seals except the 1-year-olds, controlling take of pups by seasonal restrictions, and imposing quotas in some instances.

l. *South African fur seal.* The harvest of South African fur seals is largely a state enterprise in South Africa, however, the system includes one of control and leasing of rookeries to private contractors. The South West African Administration has not entered the harvesting business, but licenses private firms, restricts gear to be used, establishes closed seasons, and places limits on sex and condition of catch.

m. *Narwhal.* Canada allows its Eskimos to take five narwhals annually for personal use and issues permits to capture this mammal for exhibition.

n. *Killer whale.* Canada allows this species to be taken under a permit system.

PART III—APPENDICES

APPENDIX A—Final Regulations Governing the Taking and Importing of Marine Mammals: FEDERAL REGISTER reference, 39 FR 1851.

APPENDIX B—Amendment to the Final Regulations Governing the Taking and Importing of Marine Mammals: FEDERAL REGISTER reference, 39 FR 14348.

APPENDIX C—Proposed Rules—Incidental Taking in the Course of Tuna Purse-Seining Operations: FEDERAL REGISTER reference, 38 FR 31180.

APPENDIX D—Interim Rules—Incidental Taking in the Course of Tuna Purse-Seining Operations: FEDERAL REGISTER reference, 39 FR 2481.

APPENDIX E—Proposed Rules—Incidental Taking in the Course of Commercial Fishing Operations.

APPENDIX F—Analysis of Economic Hardship Exemption Applications.

APPENDIX G—FEDERAL REGISTER Notices: FEDERAL REGISTER references, 39 FR 26622; 38 FR 26623; 38 FR 28581; 38 FR 30901; and 38 FR 33784.

APPENDIX F.—*Analysis of the economic hardship exemptions requested and actions taken*

Applications received	Scientific research	Public display	Products [1]	Total
Number of applications submitted	19	22	19	60
Number of animals requested (total)	649	251	125,716	126,591
Of these:				
To be maintained in captivity	22	226	506	754
To be taken and released	105	0	0	105
To be taken dead	76	0	70,000	70,076
To be killed in taking	424	0	55,210	55,634
To be killed in captivity	22	0	0	22
Action taken:				
Number of applications denied	0	6	15	21
Number of applications withdrawn	4	8	1	13
Number of applications—no action	1	1	1	3
Number of applications approved	14	7	2	23
Number of animals approved (total)	490	116	50,580	51,185
Of these:				
To be maintained in captivity	8	116	0	124
To be taken and released	96	0	0	96
To be taken dead	26	0	50,500	50,526
To be killed in taking	349	0	80	429
To be killed in captivity	10	0	0	10
Number of animals taken under exemption (total)	169	48	42,075	42,292
Of these:				
To be maintained in captivity	2	48	0	50
To be taken and released	12	0	0	12
To be taken dead	31	0	42,075	42,106
To be killed in taking	122	0	0	122
To be killed in captivity	2	0	0	2

[1] This category involves commercial or personal use of marine mammals and marine mammal products.

NUMBER OF MARINE MAMMALS INVOLVED IN ECONOMIC HARDSHIP EXEMPTIONS

Common name	Scientific name	Requested					
		Taken and kept alive	Taken and released	Taken dead	Total	Total granted	Total taken
South American sea lion	*Otaria flavescens*	4			4		
California sea lion	*Zalophus californianus*	591	2	79	672	65	45
Steller sea lion	*Eumetopias jubatus*	4		22,020	22,024	24	
South African fur seal	*Arctocephalus pusillus*			70,000	70,000	50,500	42,075
Northern fur seal	*Callorhinus ursinus*	3	9		12		
Pacific harbor seal	*Phoca vitulina richardii*	31	50	150	231	196	116
Northwest Atlantic harbor seal	*Phoca vitulina concolor*	12	20		32	25	5
Ice-breeding harbor seal	*Phoca vitulina largha*	5		20,260	20,265	155	1
Ringed seal	*Pusa hispidus*	7		3,090	3,097	94	1
Gray seal	*Halichoerus grypus*	7			7	3	2
Ribbon seal	*Histriophoca fasciata*	2		25	27	27	
Harp seal	*Pagophilus groenlandicus*			10,000	10,000		
Bearded seal	*Erignathus barbatus*	8		30	38	38	8
Northern elephant seal	*Mirounga angustirostris*	5			5	5	
Gray whale	*Eschrichtius robustus*		3		3	3	3
Atlantic bottlenosed dolphin	*Tursiops truncatus*	54			54	55	20
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	6	6		12	12	6
Dusky dolphin	*Lagenorhynchus obscurus*		15		15	15	4
Spinner dolphin	*Stenella longirostris*	7			7		
False killer whale	*Pseudorca crassidens*	1			1		
Pilot whale	*Globicephala macrorhyncha*	12			12	11	
Killer whale	*Orcinus orca*	13			13	1	1
Harbor porpoise	*Phocoena phocoena*			30	30		
Belukha whale	*Delphinapterus leucas*	4		25	29	1	4
Beaked whale	*Tasmacetus Sp.*			1	1	1	1
Total		776	105	125,710	126,591	51,207	42,292

SUMMARY OF ACTIONS TAKEN ON UNDUE ECONOMIC HARDSHIP EXEMPTIONS AS OF OCT. 21, 1973

Scientific research applications:	*Action taken*
Norris, University of California	Approved.
Winn, University of Rhode Island	Do.
Paulbitski, California State University	Do.
Richardson, Maine Department of Marine Resources	Do.
Buhler and Mate, Oregon State University	Do.
Handley, Smithsonian Institution	Do.
Stone, University of Texas	Do.
Hall, University of California	Do.
Knudtson and Loughlin, California State University	Do.
Newby, University of Washington	Withdrawn.
Scientific research applications:	
Elsner, Scripps Institute of Oceanography	Approved.
Vedros, Naval Biomedical Research Laboratory	Do.
Brooks, Alaska Department of Fish and Game	Do.
Galster, University of Alaska	Withdrawn.
Miller, University of Alaska	Do.
Wuersig, State University of New York	Approved.
Underwood, Naval Arctic Research Laboratory	No Action.
South, University of Missouri	Withdrawn.
Kooyman, Scripps Institute of Oceanography	Approved.
Public display applications:	
Sea World, Inc., San Diego, Calif	Approved.
Seattle Marine Aquarium, Seattle, Wash	Withdrawn.
Scientific research applications:	
Gulfarium, Fort Walton Beach, Fla	Denied.
Sea-Arama Marineworld, Galveston, Tex	Approved.
Black Hills Marineland, Inc., Rapid City, S. Dak	Do.
Japanese Village, Buena Park, Calif	Denied.
Detroit Zoological Park, Detroit, Mich	Withdrawn.
San Diego Zoological Gardens, San Diego, Calif	Approved.
Mystic Marinelife Aquarium, Mystic, Conn	Do.
Henry Doorly Zoo, Omaha, Nebr	Do.
Fort Wayne Children's Zoological Gardens, Fort Wayne, Ind	Withdrawn.
Quinlan Marine Attractions, Lincolnton, N.C	Do.
The Aquarium, Depoe Bay, Oreg	Denied.

Scientific research applications:

	Action taken
Bob's Seafood, Morro Bay, Calif	Withdrawn.
Gianfuretto Salvadori, Dover, Pa	Denied.
Undersea Gardens, Marina del Rey, Calif	Do.
Aqualand, Inc., Bar Harbor, Maine	Withdrawn.
Theater of the Sea, Inc., Islamorada, Fla	No Action.
Homosassa Springs, Inc., Homosassa Springs, Fla	Withdrawn.
Louis Scarpuzzi Enterprises, Inc., Fort Myers, Fla	Approved.
Sea Life, Inc., Waimanalo, Hawaii	Withdrawn.
Dianna Wilson Allen, Donna Tex	Denied.

Personal and/or commercial use applications:

	Action taken
Sea Lions International, Santa Barbara, Calif	Denied.
Bergner International, New York, N.Y	Withdrawn.
Alaska Research Co., Seward, Alaska	Denied.
Frontier Tanning Co., Anchorage, Alaska	Do.
Global Sea Lions, Inc., Santa - Barbara, Calif	Do.
Roy C. Randall, Port Williams, Alaska	Do.
William Nietupski, Kodiak, Alaska	Do.
Andrew Nault, Kodiak, Alaska	Do.
Jerry Richmond, Old Harbor, Alaska	Do.
Kenneth Sellers, Anchorage, Alaska	Do.

Personal and/or commercial use applications:

	Action taken
Joe D. Mankins, Port Heiden, Alaska	Do.
Jeff Graham, Port Heiden, Alaska	Do.
Fred A. Kings, Anchorage, Alaska	Do.
Keith C. Koontz, Savoonga, St. Lawrence Island Alaska	Approved.
Roscoe Harrell, Whittier, Alaska	Denied.
David Andrews, Kodiak, Alaska	Do.
Frontier Tanning Co., Anchorage, Alaska	Do.
The Fouke Co., Greenville, S.C	Approved.
Pleasant Point Passamaquoddy Tribal Council, Perry, Maine	No Action.

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(Revised as of April 1, 1974)

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